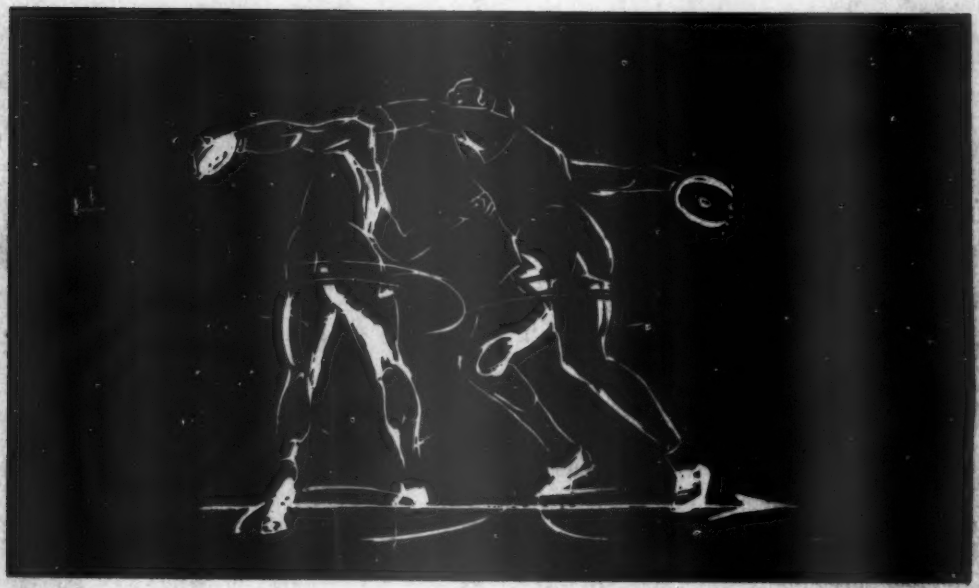
# TRACK & FIELD

## *CLINIC NOTES*



NATIONAL
COLLEGIATE
TRACK COACHES
ASSOCIATION ☆

1959 1958?

# *The National Collegiate Track Coaches Association*

NOTES

of the

# 29th

Annual Meeting

SPRING SESSION - BERKELEY, CALIFORNIA

WINTER SESSION - CINCINNATI, OHIO

EDITORS

Don Canham and Phil Diamond

DESIGN & LAYOUT
by
Don Canham

PUBLISHED BY

*"Champions on Film"*

303½ SO. MAIN STREET
ANN ARBOR, MICHIGAN

PHOTOGRAPHS SUPPLIED BY

Athletic Journal - Evanston, Illinois
"Champions on Film" - Ann Arbor, Michigan
Scholastic Coach - New York, New York

Contents cannot be reprinted or reproduced without permission of the secretary of the NCTCA.

# TABLE OF CONTENTS


| Title | | Page |
|---|---|---|
| N. C. T. C. A. Officers | | 1 |
| 1958 All-American Team | | 2 |
| Report of Annual Meeting of the N. C. T. C. A. | | 3 |
| Running the Mile | Bill Easton | 7 |
| Hop, Step and Jump | Eng Yoon Tan | 16 |
| Training for the Quarter-Mile | Jim Lavery | 42 |
| Middle Distance Running | Arthur Wint | 45 |
| Running the Half-Mile | Charles Beetham | 48 |
| Running Form | Fred Wilt | 53 |
| Low Hurdling Around a Turn | Wilbur L. Ross | 59 |
| Notes on Sprinting | Bill Carroll | 62 |
| Notes on Relay Passing | Larry Snyder | 63 |
| Glenn Davis - The 440 | Larry Snyder | 65 |
| Sprinting | Bud Winter with Ray Norton | 66 |
| Distance Running | Jess Mortensen with Max Truex | 68 |
| The Broad Jump | Gordon Fisher with Greg Bell | 71 |
| Report on Track Shoes | Bill Bowerman | 74 |
| All-Weather Surfaces for T & F Events | Payton Jordan | 76 |
| Oregon's Hard Surface | Bill Bowerman | 79 |
| Rubber Asphalt Runways | Stan Pavko | 83 |
| All-Weather Surfaces | Robert Epskamp | 85 |
| Questionnaire on Surface Materials | Bill Jordan | 91 |

## NATIONAL COLLEGIATE TRACK COACHES ASSOCIATION

### 1958 - 1959 OFFICERS

| | |
|---|---|
| President | Don Canham - Michigan |
| Vice President | Bill Bowerman - Oregon |
| Secretary-Treasurer | Phil Diamond - Michigan |

### ADVISORY COMMITTEE MEMBERS ELECTED BY N.C.A.A. DISTRICTS

I Doug Raymond, Boston
1958 to 1964

II Robert S. Grieves, Syracuse
1956 to 1962

III Dale Ranson, University of North Carolina
1956 to 1962

IV Dave Rankin, Purdue
1958 to 1964

V Francis Welch, Emporia Teachers College
1957 to 1963

VI Oliver Jackson, Abilene Christian
1956 to 1962

VII Jim Emmerich, South Dakota State
1957 to 1963

VIII Stan Hiserman, University of Washington
1958 to 1964

Past President - is member of Advisory Board

Payton Jordan - Occidental College - 1956

Lloyd "Bud" Winters - San Jose State - 1957

George Eastment - Manhattan - 1958

# 1958 ALL-AMERICAN TEAM

**Following the National Collegiate Championships at Berkeley, California, in June 1958, the NCAA Rules Committee selected the following All-American team for 1958. A certificate is awarded to each member of the team by the National Collegiate Track Coaches' Association. The selections for each event are listed alphabetically, not in preferential order.**

### 100 Yard Dash
Morrow, Robert - Abilene Christian
Murchison, Ira - Western Michigan
Norton, Raymond - San Jose State

### 220 Yard Dash
Collymore, Edward - Villanova
Morrow, Robert - Abilene Christian
Norton, Raymond - San Jose State

### 440 Yard Dash
Davis, Glenn - Ohio State
Southern, Edward - Texas
Yerman, Jack - California

### 880 Yard Dash
Bowden, Donald - California
Delaney, Ronald - Villanova
Murphy, Thomas - Manhattan

### One Mile
Delaney, Ronald - Villanova
Grelle, James - Oregon U.
Hodgson, Gail - Oklahoma

### Two Mile
Henderson, Alexander - Arizona State
Jones, Charles - Iowa
Truex, Max - USC

### High Hurdles
Gardnor, Keith - Nebraska
Gilbert, Elias - Winston-Salem
May, William - Indiana

### High Jump
Dumas, Charles - USC
Haizley, Ernest - Illinois
Stewart, Donald - Southern Methodist

### Pole Vault
Davis, Robert - Missouri
Johnston, James - Purdue
Lyons, Stanley - Ohio State

### Broad Jump
Bell, Gregory - Indiana
Mitchell, Robert - Illinois
Shelby, Ernest - Kansas

### Shot Put
Davis, Dave - USC
Henry, Robert - Minnesota
Silvester, Jay - Utah State

### Discus Throw
Babka, Rink - USC
Oerter, Al - Kansas
Silvester, Jay - Utah State

### Javelin Throw
Fromm, John - Pacific Lutheran
Johnson, Rafer - UCLA
Quist, Buster - New Mexico

### Hammer
Keerd, Eino - Boston U.
Lawlor, John - Boston U.
McWilliams, William - Bowdoin

### Low Hurdles
Gilbert, Elias - Winston Salem
Tidwell, Charles - Kansas
Washington, Francis - Winston Salem

# REPORT OF THE ANNUAL MEETING OF THE NCTCA

## BERKELY, CALIFORNIA JUNE 13, 1958

The meeting was called to order by President Eastment at 11:50.

The minutes of the 1957 meeting were accepted as printed.

The Secretary-Treasurer's report was read as follows:

| | | |
|---|---|---|
| Dues paid by 337 active and associate members | $ | 1,584.00 |
| Sale of Clinic Notes 1956-57 | | 569.50 |
| Winter Clinic receipts | | 182.00 |
| Received from sale of All-American certificates | | 88.00 |
| Total receipts | $ | 2,423.50 |
| Balance carried forward from 1956-57 report | | 125.55 |
| Total balance | $ | 2,559.05 |
| Total expenditures 1957-58 | | 2,040.15 |
| Balance on hand June 13, 1958 | $ | 508.90 |

Acceptance of the report was moved and passed.

The report of the Auditing Committee was read by Chairman Carl Olson. The report was approved.

President Eastment read excerpts from a letter which had been turned over to him by Walt Byers. It was from a Bible Foundation School, and was presented as an example of a dozen or more similar letters received each year. The essence of the letter was a request for track and field equipment. The President suggested that the members keep in mind the fact that many institutions can find use for old uniforms and discarded equipment.

The President read a letter from the New Mexico Military Institute suggesting that the Association design and distribute a membership pin to be worn in the coat lapel. The matter was laid aside for future consideration.

The President reported that members of the Rules Committee had asked for recommendations on changes in the championship program. He said that he had promised to bring about a closer relationship between the Association and the Committee and that he had been working on it. Tom Botts asked that the membership go on record as recommending that the low hurdle race be run on the straightaway if possible. He so moved and Robison seconded. The motion was approved. Robison then moved that the recommendation be made to apply to the vurrent meet. There was no second.

Bud Winter proposed adding another distance event to the program in order to pre-

vent overcrowding in the mile race, and also to add the 400 meter hurdles and the hop, step and jump. The President called for expressions of opinion. Giegengack suggested that each event be taken up in a separate motion. He moved that the 400 meter hurdles be added to the program. Olson seconded. Potts reported that the Rules Committee was open to the following recommendation: the 400 meter hurdles instead of the 220 lows; a 3 mile race instead of the 2 mile; the addition of the hop, step and jump and the hammer.

Jim Kelly thought it wouldn't be right to deprive low hurdlers and 2-milers of the opportunity to compete in their accustomed events; it is proper to add events, but not to take them off the program. Mortensen pointed out that we do just that in an Olympic year.

Giegengack here withdrew his motion. He moved that there be added to the NCAA program the 440 yard intermediate hurdles, the 3000 meter steeplechase and the hammer. Higgins seconded. Littlefield asked if all conferences would add these events. Fisher asked, why not the hop, step and jump? Bowerman moved to add the hop, step and jump. Giegengack wondered if the package is too big, that one event at a time might be acceptable. Snyder said that if the problem is adding new events, why not the 600 or the 1000 to relieve the congestion where it is worst. Giegengack again withdrew his motion. Werner thought that the whole matter should be left to the Rules Committee.

Jordan asked if we were ready to train boys for the 400 meter hurdles. Why not the 220 intermediates? Mortensen said that he had suggested the 220 intermediates to the Rules Committee but had withdrawn the suggestion, partly because of fear of injuries. He said the Rules Committee would consider the 440 yd. hurdles for 1959. Jim Kelly said the only reason for the 400 meter hurdles is to prepare the boys for the Olympic Games. The boys themselves would rather run the races as they are now.

The President suggested that some one move the addition of the events mentioned for the 1959 meet and see what would happen. Jess Mortensen moved that in the 1959 NCAA meet the 400 meter hurdles should be run in place of the 220 lows; the 3 mile in place of the 2 mile; that the steeplechase, the hammer throw and the hop, step and jump be added. The motion was seconded. Botts offered an amendment to add the 400 meter hurdles, not to replace (this for 1959 only). This was seconded and the original motion was passed about 40 to 10.

Payton Jordon spoke about the high school coaches, that we should be making greater efforts to bring them into closer touch with the Association. He said that we had mentioned this at the '56 meeting and had even had a meeting for the high school coaches present, but that we haven't done much about it since, What can we do? Bev Rockhold of Baytown, Texas (he had brought up the subject in the '56 meeting) said that he had written to every high school coach in Texas, that he had received many answers, but the general feeling among these coaches was that college coahces were not too interested in their problems. They would prefer a high school coaches' organization, with local clinics, etc. Mortensen mentioned the California association of high school coaches. We should be working with them. Bowerman said that the Oregon coaches had a publication of their own; it costs little and keeps them in touch. Jackson said that there were meetings and clinics in Texas. The President mentioned the expense of carrying the high

school coaches as members for the $4.000 dues. He ended the discussion by suggesting that the Advisory Board take up the entire matter.

NEW BUSINESS.

The President reported on a long series of negotiations that had been going on with General Mills and their advertising agency, Knox-Reaves. As part of their advertising program, they had made agreements with various coaches' organizations whereby the latter would name All-American teams which they could use in their publicity. The first version of the contract had contained several provisions which were too one-sided, e.g., any use, their option of renewal on a yearly basis. Strangely enough, Byers had approved this contract. The President said he had taken the matter up with the AAU. After many meetings, the advertising agency had come up with a revised contract. In the new version, which is for one year only, the options have been removed, there is a stronger clause protecting amateurs, the methods of publicity are to be cleared with the AAU. For permitting the use of the All-American choices in their publicity (General Mills is promoting a physical fitness program in connection with Wheaties), the Association is to receive $1,000.

There was a great deal of discussion on the subject. What is behind it? Aren't we worth more than $1,000? Can any good come from it? Wrestling also got $1,000; aren't we worth more? Aren't we doing almost the same thing now? Larry Snyder moved that the incoming officers, in consultation with the Advisory Board, be empowered to act on the basis of one year at a time, for the good of the sport and the Association treasury. Jim Elliott seconded and it passed unanimously. Bill Easton praised the handling of the matter by the President and hoped that we might be able to do still better financially in the future.

Bud Winter announded the first meeting of the International Coaches' Association in Europe, to be held in Athens January 4-10. The Greek Association will pay all expenses in Greece for one delegate plus one coach. Two possible representatives were mentioned, with the hope that we would be represented without expense to the Association. The matter was left to the incoming president. (It might be of interest to note that we were represented at the European meeting by Coaches Arnesson of the Air Force Academy, and George Rider of Miami.)

Don Canham reported briefly on the sale of the Clinic Notes; he said that there would be from five to six hundred dollars profit for the Association.

Bill Bowerman spoke briefly on the survey of shoes that he had conducted. Copies of the report were distributed among the membership.

Mike Ryan spoke about the distance running colony at the Santa Clara Youth Center. He said that Igloyi, the famous Hungarian coach, was available for help to any interested coaches or individuals. The Youth Center will help any interested runners get summer jobs and opportunities to run throughout the summer. The Center would accept no responsibility, but would be glad to welcome boys to the camp.

The Nominating Committee then made its report. It presented the following slate of candidates:

| | |
|---|---|
| President | Don Canham, University of Michigan |
| Vice-President | Bill Bowerman, University of Oregon |
| Sec'y. - Treasurer | Phil Diamond, University of Michigan |

For the Advisory Board:

| | |
|---|---|
| District I | Doug Raymond (in place of Noyes, retiring) |
| District IV | Dave Rankin (in place of Canham, retiring) |
| District VIII | Stan Hiserman (in place of Mooberry, retiring) |

The slate was elected by acclamation.

The meeting adjourned at 1:05.

Respectfully submitted,

Phil Diamond

Phil Diamond
Secretary

# RUNNING THE MILE

By: Bill Easton
University of Kansas

It is my honor and privilege to discuss with you the most illustrious event on the International Track schedule - the mile. Much has happened to the mile or 1500 meters since the first modern Olympic Games in 1896 when Falk of Great Britian won in 4:33.2 and Elliott's 3:36 for the 1500 meters in Sweden last summer. Probably all I should say is - it has been done. The four minute barrier has been broken - under 3:55 has been achieved and now 3:50 is predicted for the mile.

I hesitate to discuss a training program for such an explosive event, one that has enjoyed such dynamic and sudden revision in the last four years between the dates of May 1954 and August 1958. I was rather finessed into my present position by Don Canham of the NCAA Cross Country Meet at Michigan State when he asked me to sit in on a panel discussion of distance running and I agreed. Upon receipt of the card announcing the clinic ten days ago, I found myself introduced to the country as author of a paper on "Training for the Mile".

Actually, I don't have a great miler on the horizon. Of course, I could take credit for Santee of a few years back. Santee, a great runner who lived some four or five years before his time, but went the way of many of our great world milers. Many training concepts have been changed since May 1954 and I hope that I can adequately cover some of these and stimulate your thinking on the modern methods of training for the mile. After Bannister destroyed the mental barrier by breaking through the 4-minute iron curtain with a 3:59.4 some 22 men have run under four minutes approximately 49 times and at Dublin last summer five men were under four minutes in the same race.

This points up the questions - How come so much improvement in such a short period? What quality should a young man possess to become a sub-4 minute mile? Of the many that I have thought about, I would like to list five or six that I feel in part answer these questions.

1. Natural Ability 50%. A gifted individual still requires two or three years or more to condition himself for greatness.

2. Speed and Endurance. Natural speed and the built-in endurance through hard work. A happy correlation between these in workout schedules.

3. Desire. A dedicated determination to exclude all other things in a rugged determination to overcome all obstacles.

4. Intelligent Training and Basic Racing Tactics. He must be directed intelligently and taught correctly, ironing out basic errors in posture and mistakes in judgment during his workouts and competition.

5. **Possess Physical and Mental Courage to the Threshold of Absolute Fatigue.** Build a knowledge of self and develop the ability to drive himself from within to perform close to his potential.

6. **Have World of Top Competition.** Compete against the "best" in his particular event. Learn that he must train hard because competition will be hard and have the will to go on.

In checking these comes the answer to some extent of why so many fine young men with potential ability fail to reach championship caliber. We feel -

1. They lack the greater desire to improve.

2. They fail to use the most advanced training methods.

3. They fail to develop greater physical and mental courage.

4. They have failed to compete long enough to develop to full potential and maturity. This, undoubtedly, is the answer on the American level.

In considering each of these points it is very important to investigate the background of each young man who comes out for the mile.

a. We must look to his age as we find the college man of today in American is anywhere from one to three years younger than he was just a few years ago.

b. It is interesting to note his ancestors and their background.

c. What has been the work background of this particular young man? Has he had a job in the early morning as a newspaper boy? Has he worked on the farm or has he been a milk route youngster, running from spot to spot?

d. What are his desires toward an education and is he dedicated to become better in his chosen event and does he show the mark of leadership?

All of these will give a very concrete answer as to his eventual future in track and field athletics.

Experience is a terrific teacher for the college man and it is imperative that we compare the American College boy with the more mature European runner. To point out a few facts about the American boy. We must remember he has great demands by each of his professors in each of his subjects in school; that he enters college at a younger age than he did a few years ago. His track workout schedule will be only a small part of his daily schedule when he comes out in the afternoon as he must fulfill an evening schedule of outside activities, plus preparing for the next days' class schedule. Now, the European runner, being older, usually has a job, or is in the ser-

vice of his country giving him more free time for his training program. Since is is mature he can absorb a much heavier workout schedule and will naturally be able to improve accordingly. He has no demands upon him in the morning or late afternoon hence he can carry out an elaborate training schedule consuming from three to five hours a day. When this is completed, he is completely free to relax since he has no outside demands upon his time during his evening hours, Consequently, the United States coach must have a definite understanding of his charge, help him in his direction, build in him a confidence in his own ability and inspire the youngster to greater perfection. All of these are musts as far as the coach is concerned.

Our training program is first a matter of on and off the track and secondly, greater emphasis on upper body work as compared with those things off the track such as an individual training. We would insist upon all of the necessary upper body work of rope climb, pulleys, medicine ball, high bar, weight lifting, calesthenics, sit ups in the program plus the different types of running programs on the track. It is just as imperative though, that we insist upon the correct amount of sleep and rest, the correct diet for a man in training, daily workout schedule, no drinking or smoking and the use of vitamins and minerals as a supplement to the college diet.

I want to emphasize the subject of warmup. We feel this is one of the most undertaught items in our workout program today. Few realize the importance of teaching warmup since very little has been written concerning the proper amount of time and procedures to follow in a warmup for young runners. Although each must learn his individual warmup routine here is a fairly comprehensive warmup procedure:

a. Slow easy jogging.

b. Work up into fast, steady pace.

c. Calesthenics. Do stretching and twisting exercises.

d. Work straightaways at first easy, then increase pace until you are running the last ones at full speed.

Follow the old axiom (1) run as hard in the last part of your warmup as you will have to run at anytime in your race. Rest 12 to 15 minutes before race. With more maturity and greater work program follow axiom (2): The more work you have done the longer your warmup period will require.

Getting into the procedures of Running Techniques: After having read all of the past articles in the NCAA Coaching Clinic Notes plus many articles in Track & Field News and other books and magazines, I have tried to place a few of these points in proper sequence:

a. Foot plant. Very important as the distance runner sets his foot down on the outside, rolling it to the inside and coming through on the ball of the foot. The toes should be pointed straight and the drive should be forward at all times.

b. Leg movement. With the distance tempo used rather than the sprint tempo in the American style. A fast leg motion is still very good.

c. Knee lift. The knee should be lifted - never throwing the foot forward, followed with the relaxed back kick coming through.

d. Hips remain loose and relaxed.

e. Chest held high to permit deep breathing.

f. Arms cocked 90 degree angle, with elbow pulled, wrists relaxed, hands with slight tension only.

g. Shoulders lifted slightly.

h. Breathing rhythmatically and smooth.

i. Alert mentally at all times.

j. Fatigue, as we know, is both physical and mental. These have been discussed several times by Billy Hayes, Chick Werner and others in their various articles so we realize few men in top condition are ever really physically fatigued. The mental fatigue factor can be brought on by many things. Running a poor race, troubles at home, a girl and worry over studies. A boy must learn to recognize physical fatigue and be strong willed enough to over-come this through its recognition. He must break through this condition with determination and go on - like going through an open door. This lesson he learns by doing onver-distance. For instance, Elliott running 33 miles in 4:01. (four hours and one minute) Run until it hurts and run some more. Elliott says, "It strengthens the spirit, teaches us to fight against pain, that's what keeps us going fast-in the mile race, when we feel we want to stop."

Work Schedules. Each work schedule is an individual proposition. Here is the pattern we have followed at the University of Kansas. This is more or less the old Billy Hayes theory ("Indiana") of: overdistance followed by pace work followed by speed work plus the addition of modern fartlek and interval running. This means heavy overdistance the first part of the week off the track followed by short pace work on the track and always finishing the day with a little speed work. As the week progresses the overdistance is cut down each day as you get closer to competition and the pace speed work is automatically increased. Today there are many new work programs that take us into our modern heavy work schedules for boys:

a. Cross Country in the fall to build up the heart, lungs, producing strength, stamina and speed throughout the entire body through overdistance work.

b. Fartlek - including hill work. Much has been written and is well understood about this subject, by all of you gentlement The innovation of this type of training schedule has been given credit to Holmer of Sweden working over a period of time off track rather than running a set distance - walk, jog, sprint, (repeat) without excess fatigue.

c. Interval Running as propounded by Stempfl who calls it the "core of modern running" is very flexible, induces speed, stamina, teaches pace and judgment as well as creates general physical well-being. There are many varibles possible in this elastic system. Here are a few examples:

1. Exact repeat with the distance unchanged. (Check pace under the watch.) Basic distance may vary, but should not exceed 1/2 the racing distance.

2. The (rest) interval can also be changed.

3. Increase (or decrease) the number of times the distances are repeated and you may shorten the rest interval as the condition of the runner is improved.

4. Increase (or decrease) the speed the distance is run.

d. Repetitions - these should come later in the season as the physical condition of the runner improves. Running a set distance with longer rest period. The distance and the rest period must be an exact, i.e. such as running a 3 fast mile with a 30 minute rest in between.

e. Time Trials - for the advanced runner as he reaches his top conditioning.

The emphasis on the recovery stage has been brought out by many articles, but it is important that we understand this recovery period as it is the key to the gradual improvement in these young men as they progress. So, we should learn the recovery stage must be shortened as the individual's condition improves as the season progresses.

It is also important to know pace. Judgment of pace is of utmost importance to the individual runner. Only the man who has built up great base power and strength can maintain a fast pace with relaxation. It is the pace that kills! Zalopek could run at the average good runner's pace and recover on this pace. So it is paramount that the young runner recognize pace and its real worth.

We find boys can handle heavier work schedules, but we are attempting these under closer medical supervision with strict orders and from our fatigue labs dictate from the medical profession. I would like to point up with this note taken from Track Y & Field News of June 1958 where Woldermar Gerschler reknowned German coach of such greats as Harbig, Barthel, Moens and Pirie says:

> "The method evolved by Drs. Hans Reindell and myself demands hard training by the athletes; hence the hostility aroused in some

quarters. 'This sort of training is too tough and dangerous', certain critics have said. These allegations are unjust. Admittedly we ask for a considerable effort from our athletes. But we have never "guessed" the maximum effort of which an athlete is capable in training; we work on scientific and medical evidence to find the limit of what may be demanded from the human body. Time after time, our methods, based on Prof. Reindell's research, have been proved justified.

"Our view is that an athlete's body can adapt itself to the stresses of more strenous sporting performances by correct application of scientifically planned training. Too easy a program cannot stimulate the body sufficiently. Our schedules are based on knowledge of what the body, and particularly the heart, can stand. The formula is: Dosed effort leads to organic adaptation, which leads to better performances. We continually examine runner's heart conditions during our researches. Science reveals how much the runner can achieve when his training is methodical in this way, and I am convinced that the limit of human achievement will be further expanded in the future. From numerous examinations of splendidly trained athletes, I feel sure that better breathing technique alone will improve existing records."

All this equals a year-round training program today. The only variable is the amount of work done at various times.

Racing Techniques.

Changes in emphasis in running the mile by comparing the American method of fast, slower, slowest, fast vs. the European method of slow or even pace for the first half of the race and a faster third quarter, then all out on the fourth quarter. The way to break a record in the mile is to go for "broke" in the first three quarters and then all out on the fourth quarter. These methods are well sighted in the following races by outstanding contemporary milers. Here is Bannister's first mile under 4 minutes (3:59.4) taken from Track & Field News, May 6, 1954, Oxford, England. Let me point out it was a rainy, muggy afternoon.

| | | | | | | |
|---|---|---|---|---|---|---|
| 220 | :28.7 | (:28.7) | | | | |
| 440 | :58.7 | (:28.8) | | :57.5 | | |
| 660 | 1:27.5 | (:30.0) | | | | |
| 880 | 1:58.2 | (:30.7) | | (:60.7 | 1:58.2) | |
| 1100 | 2:29.6 | (:31.4) | 2:03 | ( | ) | |
| 1320 | 3:00.5 | (:30.9) | | (:62.3 | ) | 3:59.4 |
| 1540 | 3:30.5 | (:30.0) | | | ) | |
| 1760 | 3:59.4 | (:28.9) | | :58.9 | 2:01.2) | |

Here is another example. Don Bowden's 3:58.7 at Stockton, California, June 1, 1957. He was the 12th man to do under 4 minutes and the only American to ever achieve this honor.

| | | | | | |
|---|---|---|---|---|---|
| 440 | :59.7 | :59.7) | | | |
| | | ) | 2:00.8 | | |
| 880 | 2:00.8 | :61.1) | | ) | |
| | | | | 2:00.9) | 3:58.7 |
| 3/4 | 3:00.6 | :59.8) | | ) | |
| | | ) | 1:57.9 | | |
| Mile | 3:58.7 | :58.1) | | | |

Here is Dyrol Burleson's great High School mile run at Cottage Grove, Oregon, taken from the Track & Field News, April, 1958.

| | | | | |
|---|---|---|---|---|
| 440 | :61 | :61 | | |
| 880 | 2:06 | :65 | | |
| 3/4 | 3:11.2 | :65.2) | | |
| | | ) | 2:07.2 | |
| Mile | 4:13.2 | :62 ) | | |

Same Day:

| | |
|---|---|
| 440 | :51.7 |
| 880 | 1:54.7 |
| Mile | 4:26.4 |

The greatest mile field was run in Dublin, Ireland, August 6, 1958. It was also a rainy afternoon. The pace was almost perfect.

First quarter - Thomas :58 followed by Lincoln, Elliott

Second quarter - Thomas :60 - 1:58 - Elliott, Lincoln, Holberg, Delany.

Third Quarter - Lincoln took over at half - ran :61 seconds, Elliott close behind.

Going into the bell lap Elliott took over followed by Lincoln, Holberg, Thomas, Delany.

Elliott pulled away to reach the tape 12 yards over Lincoln.

All five of these men ran under four minutes, finishing in this order:

| | | | |
|---|---|---|---|
| 1. | Herb Elliott - Australia - | 3:54.5 | |
| 2. | Merv Lincoln - Australia - | 3:55.9 | 2nd fastest mile ever |
| 3. | Ron Delany - Ireland | 3:57.3 | 4th fastest mile ever |
| 4. | Murray Halbert - New Zealand - | 3:57.5 | 5th fastest mile ever |
| 5. | Abie Thomas - Australia - | 3:58.6 | Equals 8th fastest mile ever and he finished only fifth. |

After this race was over Elliott was quoted in Track and Field News, "The pace was terrific. During the first half mile I knew I was running the fastest race of my life. It was definitely my night. Conditions were perfect. And I must thank the wonderful enthusiasm of the Irish crowd for their terrific applause on my last lap. I think a 3:50 mile could come within a couple of years. Of course we shall need track conditions like the ones we had here --- conditions as near to perfect as any runner could want."

"They got off a little too fast for me but I managed to catch up with two laps to go. I found the pace really punishing, particularly among the leaders. I realized by the three-quarter mark that world record figures were possible for perhaps the first four. I felt strong at the finish and I had no doubt of the result. But plenty of credit is due to that terrific early pace set by Thomas and Lincoln." Incidentally, Herb Elliott thinks Americans are too civilized in that they eat too many soft processed foods and in general live too soft a life. He classes women as one of the principle softening processes. He prefers his food raw, his favorite breakfast being uncooked rolled oats mixed with wheat germ, walnuts and chopped fruits such as bananas, dried figs, dates and raisins." (All quotes from Track and Field News.)

Delany: "There is only one way to beat Elliott. That's to tie his legs together."

Lincoln: "It's the best race I have run in my life. I feel right on top of the world."

Roger Bannister: "Absolutely incredible."

Tricks in Teaching the Present Techniques.

a. The four minute mile as propounded by Bob Gigengech of Yale, allowing the boy to run any distance he choose but when added up it becomes a four-minute mile. This must be done within the hour.

b. b. Stairsteps (55 yards to 3/4) as propounded by Armas Valste of Finland.

c. Slow-fast paced work such as 110's, 220's, 330's, 440's.

d. Top down - such as 880's to 660's, to 440's to 220's to 110's and many other such gadgets that many of you already use.

In closing this paper, I would like to call it to your attention again that many of the greatest miles that have been run during the present barrier-breaking period have been accomplished during a heavy atmospheric condition. This has been pointed out by the fatigue labs of the United States and indicates this is an ideal atmospheric condition that helps the athlete in his record-breaking performance. Secondly, that youth is not the deterent factor that we formerly thought. Our original thinking was that only the mature athlete of 24 or 25 could take a great amount of work. But our opinions have been brought up to date in the recent performances of the great Herb Elliott of Australia.

Third, I would like to point out that diet is one of the fields in which we must make a more thorough study in the clinic and on the track to improve performances.

Fourth, breathing is also another field that we must investigate thoroughly as pointed out by Gerschler.

Fifth, we have just become aware of the benefits derived from a complete and thorough program of weight training - weight resistive exercises will build vital capacity. It is a well-established fact that native neuromuscular speed cannot be appreciably increased, but an athlete can develop his speed-potential, an ideal seldom achieved.

Again, my thanks for this opportunity. Investigation in this field will bring about much improvement in individual performances.

# "RESEARCH INTO THE HOP STEP AND JUMP"

By: Eng Yoon Tan

At the 1896 Olympic Games, the first of the Modern Olympic festivals, the world record was listed as 48 feet 6 inches by E. B. Blose of America. He jumped this distance in 1893 at the A. A. U. Championship and it survived as a world record until 1909 when Daniel F. Ahearn replaced it with a 50 feet 11 inches effort. However, at the 1896 Athens Games this event was won by J. V. Connolly, an Irish-American who jumped 44 feet 11 3/4 inches, using the Irish form of triple jumping. He was a clear 3 feet from the second man, A. Tuffere of France who jumped only 41 feet 8 inches. This is the only Olympic Games of the modern era where the margin between the winner's distance and that of the runner-up is so great. In comparison, the difference between the winning distance and that of the runner-up at the 1956 Olympic Games at Melbourne was a mere 3 1/2 inches.

In the next two consecutive Olympic Games, the 1900 and the 1904 festivals, America dominated this event, placing the first three at the 1900 games and doing even better at the St. Louis Olympiad by securing the first six places. The performances, however, were not impressive at all, the winning distance at both these games being 47 feet 5 1/2 inches and 47 feet 1 inch respectively. The winner was the same person on both occasions - M. Prinstein who also took the Long Jump title at the 1904 Games with 24 feet 1 inch.

This was the last occasion that the United States of America was to dominate in this event. Great Britain had a winner in Tim J. Ahearn, the brother of Dan F. Ahearn, at the 1908 Games. Tim Ahearn's performance of 48 feet 11 3/4 inches also won him the Olympic record and it remained so until the 1924 Games. As a matter of coincidence his brother's world record of 50 feet 11 inches was also shattered at the same Olympic meeting. The man who captured both these records was the winner, A. W. Winter of Australia, who achieved 50 feet 11 1/4 inches. Since then the Olympic performances by the first three have always been quite impressive, with the distance being never less than 49 feet.

From that we may assume that this event was being given some careful attention as to the technique and fundamental principles to obtain the maximum distance. In the period between the 1908 Games and the 1924 Games, the event can be said to be monopolized by the Scandinavian countries, vis. Sweden, Norway and Finland, who between them took 9 of the 12 places in both Games (1912 and 1920).

After the 1924 Games, the Japanese jumpers came into the limelight. Her athletic coaches applied the knowledge that they had learned from the Scandinavian coaches, and were so successful that the Japanese jumpers won this event at the next three Olympic Games - 1928, 1932 and 1936. The athletes were M. Oda (48 feet 10 3/4 inches), C. Nambu (51 feet 7 inches) and N. Tajima (52 feet 5 7/8 inches). The latter's performance at Berlin was a world as well as an Olympic record. It remained as a world record until 1951 when A. F. da Silva of Brazil, the present world record holder broke it with

52 feet 6 1/2 inhhes. The following year at the Helsinki Games, da Silva made it a double by capturing the Olympic record and title with 53 feet 2 1/2 inches. Then in 1955 he increased his world record distance to 54 feet 3 3/4 inches, and in 1956 while defending his title at the XVIth Olympiad at Melbourne he leaped 53 feet 7 1/2 inches to break his own Olympic record by a further 5 inches.

Many people thought that his 53 feet plus performance at Helsinki was really marvelous and so when he achieved 54 feet 3 3/4 inches on his world record breaking jump it became all the more incredible. The standards are, however, rising, and performances over 50 feet are being registered fairly comfortably nowadays.

Although da Silva has become the leading world figure with his great performances, the most significant progress in triple jumping has been made in the last 8 years or so by athletes from the U.S.S.R. Up to now, they have produced more athletes who have triple jumped over 50 feet than any other country. The most outstanding Russian jumper has been L. M. Scherbakov who was second to da Silva in 1952 with 52 feet 5 1/4 inches, but captured the world record from him in 1953 with 53 feet 3 inches. Then early in 1956 Scherbakov did 54 feet, but in Melbourne he could only manage 51 feet 10 inches for a sixth place. Besides these two 54 footers there is yet a third one - T. Kogake of Japan, who also in the Olympic year of 1956 jumped 54 feet to strike the headlines. But he had to jump with a strapped ankle at Melbourne and reached only 51 feet 3 3/4 inches to take 8th place.

Up to now only 5 jumpers have leaped over 53 feet - da Silva, Scherbakov, Kogake, V. Einarsson of Iceland and O. Ryakhovskiy of the U.S.S.R. Vilhjalmur Einarsson who is only 23 years old created a sensation at Melbourne when he not only took the lead in the third round of the finals but also broke the then existing Olympic record with a fine 53 feet 4 inches. This great effort earned him a second-place. He was second again to da Silva in 1957 at the Moscow Youth Games, this time the margin being very much less - only 3/4 of an inch! The fifth jumper who has gotten over 53 feet, Oleg Ryakhobaskiy of Russia who, at 25 years of age, looks the best Russian jumping prospect at the moment, as Scherbakov is now 30 years old. Ryakhovskiy became the best triple jumper of 1957 when he notched 53 feet 5 1/4 inches to win the U.S.S.R. title. His mark of 53 feet 5 1/4 inches makes him the fourth best triple jumper ever.

From the material available in the U.S.S.R., and the strides that she is making in athletics by studying the event carefully, she must be ready to show a few more 54 footers. Without a doubt she is now the leading nation in the triple jumping game. While Brazil has produced da Silva, the only athlete from his country to hold a world record, it is significant to note that a fellow compatriot of his, also of the same surname, da Silva - first name Horace, did over 52 feet. He was reported to be even better than Adhemar, but unfortunately he broke his ankle while jumping and since then he has never recovered from that injury sufficiently. While on this point, another athlete who had a mishap when triple jumping was A. Togami of Japan, also a 52 foot jumper. He broke his femur in a bad jumping effort and never triple jumped again.

In the 1952 Olympics the U.S.S.R. had one athlete in the first six. So did the U.S.A. At Melbourne Russia had two athletes among the first six, while America still had one. But her athlete, W. Sharpe, did the best distance ever achieved by an Ameri-

can athlete - 52 feet 1 inch. So it looks like the triple jumping world can expect some great jumpers from these two countries in the near future - the U.S.S.R. because she has so much potential and material and the way in which her athletics systems is harnessed to the State; and America because she has been producing so many world class long jumpers. The fact that she is not dominating the world athletics in triple jumping as she has been doing in long jumping is due to the fact that in America not much interest is paid to triple jumping. Practically all her long jumpers are outstanding sprinters or have been athletes who discovered that their 9.5 seconds or so effort for the 100 yards were not getting them anywhere in the sprinting circles, and so took to long jumping. When such sprinters turn to triple jumping as they do to the long jump, then I am sure that some very astonishing performances will be recorded in America.

Speed seems to be a very important factor in the triple jump, but of even more importance appears to be tremendous leg strength and muscular co-ordination. This is borne out by the fact that many Japanese jumpers who were not exceptionally fast have managed to clear 48 feet. Among the world famous Japanese jumpers only one - Chuhei Nambu, possess great sprinting ability, having returned 10.5 for the metric century. His other compatriots, Oda, Tajima and Harada were unable to break 11.0 seconds for the 100 metres, and yet all these men were doing 51 feet jumps. What these men and others who lack speed have in common was terrific leg strength so that they were able to spring up each time they landed on the ground. Moreover, they were good technicians in their event. But it must be pointed out that if these men had speed they would most probably have jumped even further.

Most of the well-known triple jumpers are not very tall. They have been around the 6 feet mark. The Japanese jumpers have been rather on the short side but stockily built, standing about 5 feet 6 inches to 5 feet 8 inches tall; for example, men like Oda, Nambu, Iimuro, Togami and Dan Ahearne; da Silva, the present Olympic champion, is about 5 feet 10 inches tall and so was Tajima, the 1936 Olympic champion. The Japanese jumper Kogake is about 6 feet tall, which is rather on the tall side for people of his race.

Many people believe that the taller person will always have an advantage over the shorter man because of his greater leg length which enables him to get a longer step without having to stretch so much as the shorter athlete has to. But unless the tall person has a light frame he will have to carry more body weight. Moreover, having longer limbs means that the levers will be longer and therefore more difficult to control. Another difficulty might possibly be the increased energy required in overcoming the inertia due to a longer lower limb. But these attributes are very helpful if the athlete also possesses great strength in his legs. Other things being equal, it is fair to assume that the taller and faster an athlete is, the further he will jump. From the above we can therefore try to say what is the ideal build of a triple jumper.

He should be fairly tall, about 6 feet in height, having a light frame and possess a high power-weight ratio. He should, in comparison with the whole of his body, be longer in the legs than in the body and he must be very strong in his legs, especially in his knee and ankle joints. For example, da Silva has very long legs as compared with the rest of his body and this gives people the impression that he is taller than he actually is, i.e., well over 6 feet tall. One magazine quoted his height as being 6 feet 4 inches.

When Tajima jumped 52 feet 5 7/8 inches at Berlin for a new Olympic and World record, he was reported to have been trying for a 54-foot effort. This was reasonable when one considers the amount of training he had put in, for example, he had been hopping on his take-off leg for an hour each day for a whole year in order to develop the power in that leg. His 52 feet 5 7/8 inche jump was made up of a 20-foot inch Hop, a 13-foot 1 1/2 inch Step and a 19-foot 0 3/8 inch Jump. His distances for each phase were respectable except the Step which was small in comparison. But in an article in an American magazine on athletics, Mikio Oda says that Tajima Stepped 15 feet 5 inches when he created that record. If this is true, it looks like Tajima was the first jumper to start this new trend in triple jumping - using as long a Step as is possible, thus bringing balance to each phase. This was during a time when jumpers and coaches alike were thinking of a very big hop and a very big jump, with the Step being a linking phase, and hence very small in comparison.

This "new" trend in triple jumping is one of the basic fundamentals in this event today, and one has only to look at the distances of the phases for a jumping ratio of 4:3:5 to realize that it was rather unsound. If the jumper uses this ratio, he is trying to get the maximum distance of the three phases when he has the least momentum, and is the most tired. So by making the Step as big as possible, the athlete not only obtains balance in his phases, but also prevents each succeeding phase suffering from the phase or phases before it.

To illustrate this point I would like to quote my performances in the triple jump as an example. In 1954 I was jumping 47 feet plus, with a 19-foot Hop and a 14-foot Step. Consequently my jump suffered from this big hop and step, and try as I could I only managed to jump around the 14-15 feet mark. No matter how much I tried, I just could not increase my jump because there was insufficient speed left after such a big hop and step. But when I cut down on the Hop by a foot, and the Step by 6 inches, I managed to increase my Jump from 14 feet to 18 feet, which resulted in a total effort of 49 feet 7 1/2 inches. I had reduced the first two phases by only 1 1/2 feet but the speed and balance I managed to preserve by that reduction increased the jump by more than 4 feet. Similarly sometimes an increase of 6 inches to a foot in a small step will bring a much greater increase in the overall effort.

Because of these attempts at striving for a maximal distance in each phase of the triple jump, athletes have been trying to divide each phase so that when compared with the overall jump one obtains a ratio. The most popular ratio in use before the Second World War was a 4:3:5 proportion. When in the lower 45's or so, it seems reasonable, but when in terms of jumps at the 50 feet mark, the Jump phase gets out of proportion (16'8 - 12'6 - 20'10). Here the triple jumper has to try and get the most distance of the three phases when he has the least speed available. This will lead to a tendency to cut down on the Step phase, which is most probably what the triple jumpers then did. If the 50-footers of those days, like Metcalfe of Australia, Brunette of Argentina and Tuulos of Finland had used the present method of jumping, they would most probably have jumped even further.

Several ratios now said to be in use are the 10:7:10 and the 6:5:6. Of course there are variations within these ratios. The 10:7:10 seems most suited to a beginner, but I feel that a good ratio might possibly be a 10:8:9 one. This ensures that the jumper

gets the maximum distance out of the first two phases while he has the most speed, but not at the expense of the Jump, because his Jump is still more than the Step, but less than the Hop. I believe that this ratio will get one a maximal distance for each phase. This can be seen when comparing da Silva's best figures to the above ratio when he made the world record and seeing how they fit. However, Mikio Oda of Japan says that because of the differences in each individual, no ratio is completely fallible. He points out that even in the same competition on the same afternoon the same jumper will never jump a similar way each time.

From this historical survey of the triple jump, an idea can be obtained of the changing trend in the technique and the development of this event to what it is today. The first fifty-footer, Dan Ahearne of U. S. A. when recording 50 feet 11 inches had these phases: 20 ft. - 11'3" - 19'8". It seems then the jumpers of his time were trying for a big hop and a big jump, with the step as a linking phase. The development appeared to be in the direction of a very big hop; in other words, getting the maximum distance in the first phase, with the second phase again suffering from the over-reaching of the first. This was in 1931 when M. Oda jumped 51' 1 3/8" with these marks: 21'4" - 11'6" - 18'3". So it can be said that a swing was made to the first phase.

Then came a swing over to the other extreme - the jump phase. This appeared to have been the Australian development with men like Winter and Metcalfe putting emphasis on the final phase. Thus, when Metcalfe jumped 51'9 3/8" his three phases were 18'6" = 13'6" - 20'4". I have said earlier that Tajima was claimed to be the first triple jumper to begin the new trend in triple jumping, by having a really big step when he made his World and Olympic record jump of 52'5 7/8" at Berlin. But from the record books it looks like as early as 1924 this was attempted by Brunette of Argentina who when jumping 50' 7 1/4" hopped 20'4", stepped 15'7" and jumped 14'8 1/4". He thus appears to be the first athlete to attempt a big middle phase, but he, like the others before and after him, failed in one respect - overdoing a particular phase and forgetting about maintaining balance in not one or two phases but in all three. Perhaps that was why no other athlete attempted a big step after his, until Tajima.

So we had first a big hop, then came a big jump, and finally just as Brunette did so, we had athletes going for really long steps in their triple efforts. This was carried to an extreme, as were the first two developments, by L. Scherbakov of the U.S.S.R. When he triple jumped 51'6 1/8" his three phases were as follows: 18'6" - 17'3" - 15'9". His 17'3" appears to be the biggest ever stepped by any tripple jumper in competition. It was soon realized that it was unwise to overdo any particular phase in triple jumping at the expense of the other phases, because the total effort would suffer. Balance is important in the three phases, and da Silva seems to have been quite successful in this respect. Note his 18'1" - 15'10" - 18'6" marks for a 52' 5 7/8" jump. But when he triple jumped to his present world record distance of 54'4" he recorded phases of 20'7" - 16'3" - 17'6". From this figure he appears to have tried to get the maximum out of the first two phases and then going all out for the last phase. I think this might be the new trend and development in triple jumping.

In the following table I have put the jumpers in the following order - those who went for a big hop, those who went for a big step and those who got the maximum out of their jump. By that I mean those who put their maximum effort in one particular

phase, and not on the three phases. It can thus be seen from the table that the Japanese jumpers form the group of big Hoppers; the Australians those putting most effort into the Jump, while a Russian and an Argentine stressed most upon the middle phase, the Step. In a way the swing, as it were, from one phase to the other to an extreme has been beneficial, as it has permitted the various exponents and their coaches of each particular trend to see the results of their theory. The success or failure of any "new" trend results in a development, either in the same direction, or in a different one. Triple jumping technique, as regards the balance between the three phases has taken this forward step. It is only by getting the maximum out of each of the three phases that one can obtain the maximum distance in the total effort.

## TABLE SHOWING THE DEVELOPMENTAL TRENDS OF THE TRIPLE JUMP

Emphasis on One or Two Phases Only

### The Big "Hoppers" - Short, Stocky Jumpers (5'6" - 5'8")

| Athletes | Year | Country | Hop | Step | Jump | Total Distance |
|---|---|---|---|---|---|---|
| Dan Ahearne | 1909 | U. S. A. | 20' | 11' 3" | 14' 8" | 50' 11" |
| Mikio Oda | 1931 | Japan | 21' 4" | 11' 6" | 18' 3 3/8" | 51' 1 3/8" |
| Chuhei Nambu | 1932 | Japan | 21' | 14' 6" | 16' 2" | 51' 7" |
| Naoto Tajima | 1936 | Japan | 20' 4" | 13' 1" | 19' 0 7/8" | 52' 5 7/8" |

### The Big "Jumpers" - Tall, Lanky Jumpers (6'2" - 6'3")

| Athletes | Year | Country | Hop | Step | Jump | Total Distance |
|---|---|---|---|---|---|---|
| A. Winter | 1924 | Australia | 18' | 12' | 20' 11 1/4" | 50' 11 1/4" |
| J. Metcalfe | 1935 | Australia | 18' | 13' 6" | 20' 3 3/4" | 51' 9 3/4" |
| W. Brown | 1941 | U. S. A. | 18' 6" | 12' | 20' 5 1/2" | 50' 11 1/2" |

### The Big "Steppers" - Well-Built Jumpers (6'0")

| Athletes | Year | Country | Hop | Step | Jump | Total Distance |
|---|---|---|---|---|---|---|
| L. Brunetto | 1924 | Argentina | 20' 4" | 15' 7" | 14' 8 1/4" | 50' 7 1/4" |
| L. Scherbakov | 1950 | U. S. S. R. | 18' 6" | 17' 3" | 15' 9" | 51' 6" |

Emphasis on All 3 Phases

### The "Balanced" Triple Jumpers - Slim & Powerful with Long Limbs (5'10")

| Athletes | Year | Country | Hop | Step | Jump | Total Distance |
|---|---|---|---|---|---|---|
| H. Masegawa | 1948 | Japan | 18' | 15' 5" | 17' 10" | 51' 3" |
| A. F. da Silva | 1950 | Brazil | 18' 1 3/8" | 15' 10 1/2" | 18' 6" | 52' 5 7/8" |
| A. F. da Silva | 1952 | Brazil | 21' | 15' | 16' | 53' 2 1/2" |
| A. F. da Silva | 1955 | Brazil | 20' 7" | 16' 3" | 17' 3 3/4" | 54' 3 3/4" |

## BASIC PRINCIPLES AND TECHNIQUE

Since momentum is a very important factor in this event, speed, therefore, is one of the basic principles underlying the triple jump. It is only natural that the faster one can run the further one can jump, but this is only a half truth becuase in the triple jump other factors do come in besides speed. A very efficiently coordinated nervous-muscular system is just as important, because the athlete has to perform certain movements in the air and on the three take-offs.

Balance, which is very essential in so many physical activities, is also a prerequisite here. A loss of balance in the hop landing forces the athlete to make a small and hurried step, and thereafter all form is completely lost, because he will be "fighting" from then on to regain, in vain, his balance.

Knee pick-up is one of the most important things that one has to master in the triple jump. The more that one can pick up one's knee, the better a jumper one will turn out to be. By this I mean the picking up of the knee during the hop, the step and the jump. The beginner picks up his hopping leg straight. It travels through the air straight and he lands in a bad way.

A good landing position in the hop and the step is necessary if one is to get the maximum drive into the air for the succeeding phase. The body weight must be behind the landing leg, and yet not too far back so as to cause difficulties in the landing position. In the landing, the knee must "give" and yet at the same time be ready to straighten vigorously and force the body up and forward.

Arm action is important just as it is in running. The arms help to counterbalance leg movements in the air and into the air, and in the stop and the jump phase, they help to give some impetus into the flight besides acting as balances.

The question of proportion between the three phases of the triple jump deserves a place as one of the basic principles. Unless a good jumper with all the potential has a fairly clear understanding of what this means, then he will not be able to make the best use of his potential ability. The present form of jumping has evolved out of the past. One hears of the ratios in use to get the maximum possible distance out of the efforts put in. It is difficult to state dogmatically the ratio because of our individual differenceences which makes this almost impossible, although for beginners it might be a different matter then. Even the champions themselves jump differently each time but they all have a big step. So whatever ratio is in use the criterion must lie in the step and its proportion with the other two phases. The modern conception of triple jumping is to make the step as big as is possible, thus turning the hop, step and jump into what is really the correct name for it - triple jump, as the Germans have properly named it.

The hop should never be too high. In comparison with the other phases, the hop should be the lowest as far as the flight path of the center of gravity is concerned. Next comes the step, with the jump the "highest" phase of the three. So the jumper is jumping higher each time.

A smooth approach run is necessary to give a "controlled" speed so that the trans-

fer from the speedy approach to the hop will also be smooth. Since the athlete is trying to get his hopping knee through bent, he should approach the board with a high knee pick up. This approach run must never be too long otherwise the athlete will be tiring when he reaches the board and this will result in his leaning too far back on take-off and causing too high a hop.

The head is usually the rudder in most physical movements. It also applied to the triple jump. The athlete must try to keep his head up all the time so that he is not looking down. He must try to look forward all the time, except when in the jump, when he should try to look up skywards. Thus in the hop and step the body should be upright. However, the athlete should get the feeling that he is moving forward. If he does not get this feeling, then most probably he is leaning too far back and thus losing momentum.

THE HOP:

The speed of the run up is transferred to the whole jump through the hop take-off. In order to preserve this momentum the jumper has to keep his hop as low as possible in conjunction with the purpose of gaining maximum possible distance. So he drives forward rather than up with his free leg flexed at the knee. At the same time the opposite arm also drives forward and up, to balance this powerful leg movement.

The take-off in the hop is a flat-footed one. The athlete keeps his body upright during the hop. Some books on athletics recommend that the athlete swings back the free leg straight in a hitch kick-like movement, and at the same time bringing forward the hopping leg flexed to counteract forward rotation. This is wrong as it will destroy the balance and bring about a bad landing position with the weight of the body too far behind the landing leg. The swinging of the free leg back, straightened is not necessary. If the take-off is correct and the jumper looks straight ahead, keeping his head up, he will not have much forward rotation to bother him. At the same time he strives consciously to keep his body upright as soon as he takes off. He relaxes consciously as soon as he takes off from the board, trying to float through the air. He brings forward and through, his hopping leg, bent. The free leg should be relaxed and will swing back of its own accord slightly flexed to counterbalance the action of the take-off leg. The hopping leg is kept in this position, with the thigh parallel to the ground and the lower leg relaxed. The athlete waits for the ground to come up before stretching this hopping leg to make contact. If he anticipates the landing either of two things will happen:

(1) the hopping leg moves down too soon and this results in the contact with the ground being achieved too early; so instead of the body weight being behind the hopping leg on landing it will be in front, because the leg will have moved back by then. A hurried and small step results. Or,

(2) it causes the hopping leg to straighten and extend too soon. Thus, instead of an ideal landing whereby the hopping leg contacts the ground, flexed, to reduce the shock of landing, and then extends in the driving action of the step take-off, the take-off has to be made too hurriedly, because of the early straightening of the hopping leg. Just as in (1) the resultant step is small and very low, and balance is completely lost.

The arms, too, play an important part because they act as balances. Much attention is paid to the arm action of track athletes, but little detail is kept of triple jump-

ing arm action. The tendency is for the athlete to land from the hop with his arm wide of his body. Instead, the arm should travel in the same plane as the legs, straight forwards and backwards. If one of the arms swings too far to the rear on landing, then it will tend to pull the shoulder on the same side to the rear also, and this will upset the balance of the jumper.

So in the hop landing, just before contact with the ground is made, the right leg will be trailing (hopping with left leg), relaxed and slightly flexed at the knee. The left leg is in front of the body, flexed at the knee. The thigh has been parallel to the ground, but the knee which has been brought sharply through, has been gradually dropping as the lower leg starts to stretch out slightly. The body is upright all the time. Landing can either be flat-footed or on the heel. Mikio Oda, one of Japan's leading coaches in this event, says landing on the ball of the foot is preferable because less momentum is lost in this way.

In the actual landing position the left leg is slightly in front of the body with the body weight just behind it. The right leg which has trailed has moved close to the body, still flexed at the knee. The athlete is now in a compact position and a powerful one to thrust from. The two arms are close to the body having moved - the right one down and back and the left one down and forwards. The body is upright; in this compact position no unnecessary or excessive strain on any particular section of the body other than the hopping leg is placed.

The left leg "gives" at the knee and so do the hips, but more in the former, This "giving" or flexion of the hopping leg is very important because it is the ultimate straightening of this leg with an explosive extension that provides the "spring" for the Step phase. The ankle helps with an additional drive when the knee has been fully extended.

Just prior to the hop landing the athlete has actually gathered himself for an explosive spring into the air for the Step. This means there is a continuity into the following phase. Although the left leg but its powerful extension provides the "spring" for the Step, it is aided by several other muscular movements and efforts, viz., the hip extending, the trailing right leg being brought through, flexed at the knee, powerfully upwards. The lower leg is kept close to the thigh, so that the foot does not precede the knee. The left arm is "hooked" forward and up, bent at the elbow so that it turns out, while the right arm is driven back. Both arms are moved vigorously in conjunction with the powerful leg extension. The left ankle also helps to provide the finishing touch to an already extending leg drive, up.

While some athletes drive the left arm forward and the right arm backward, others use both arms in a forward direction, thus concentrating on the lift which is so necessary in this phase. Both arms are swung forward flexed and then they straighten.

The jumper then "floats" through the air in this manner, i.e., he relaxes and tries to maintain this for as long as he can. Just before the landing occurs, the athlete swings both the arms to a point behind his body via a lateral plane. They remain there, flexed slightly by reflex action as they are relaxed, until the landing is about to take place for the Jump. Then they move down and forward so as to coincide with the upward

drive for the Jump.

The left leg of the athlete will have been trailing behind his body just after the Step take-off. But this leg does not remain in this trailing position all through the Step phase because this is an extremely difficult position to hold. It imposes a severe strain upon the thigh flexors, viz., the Hamstrings, as these muscles are "direct" load muscles and will not be capable of holding this heavy load. This partly explains why athletes who try to trail the Step take-off leg in the air are soon forced to cut down their step length and make a premature landing. This trailing leg also causes the athlete to counteract the reaction set up by throwing his leading leg straight, instead of the ideal manner of holding it, i. e. with the lower leg at right angles with the leading leg thigh.

So this trailing leg in the Step phase should be allowed to come forward flexed where it will remain in a flexed position just under the body. There is now little or no strain because this leg will then be directly below the body and so the hamstrings will not be forced to hold the leg out and up against gravity. It can be seen that this latter position is more compact and balanced. (To see the difficulty and to compare the two positions, try holding these two positions while using the arms as supports on the backs of two chairs and note the difference.)

Just before the landing as the two arms are thrown, moving to the rear of the body, this trailing leg commences to move back - this is merely a reaction to the front leg (right) moving forward and "opening" at the lower leg. So to an observer, the hop, step jumper appears to stretch more for the Step in this late stage, because he first notices the rear leg moving up and then the two legs "open" out - one going forward and the other moving back. In the 1936 Olympic Games at Berlin, Tajima, the Japanese Olympic Champion and World Record holder then, gives this impression on the film to the ordinary observer.

Because of the difference in the arm action between the one arm forward and one arm back, and the two arms forward style, there will also be this difference being carried over in the Jump take-off. In the first style, which is the more common one in use, the left arm is forward to balance the right stepping leg and the right arm is back. These two arms move down to a position by the side of the body, as the Step landing takes place. This is to keep the body in a compact position and also to help "cushion" the shock in landing. If the arms are held away from the body, the muscles holding them in that particular position are in a muscular tension and this means that these muscles will not be relaxed. Hence they will "oppose" the landing and cause discomfort. Moreover, the arms will also have already started to move in conjuction with the legs to balance.

As in the Hop, the landing leg "gives" in at the knee and ankle with a slight flexion, assisted by the hips and the whole body. The jumper's main aim now is to get as much height as he can because he had the least momentum left. Therefore he can now afford to have his body weight a little further back than what it was in the other landing. Although there is more body weight behind, the jumper still strives to get his center of gravity forward when he leaves the ground. Some jumpers commit the fault of jumping when still leaning back and thus obtain good height but poor distance as a consequence.

Others are so keen to get the jump that they land with the body weight too far forward from the Step, and all they succeed in doing is merely to fall into the pit from the Step. There is hardly any spring into the air at all.

In the correct technique the jumper uses his arms and trailing leg to help get drive and height for the Jump. The trailing leg is swung through flexed at the knee, as high as the knee will go, in an effort to get the hips up as high as possible. The lower leg is kept close to the thigh in this vicious swing through so that a fast movement can occur. The body is not kept upright but is "pushed" up to get height. Once the athlete has left the ground in the Jump, he strives to keep a good body balance in the air as long as possible, fighting off the tendency of the upper body to rotate forwards and downwards. This entails keeping the hips in front of the body, i. e. putting the upper body in a backward displacement, or upright. The next important thing for consideration is to get the body into a good landing position, so that the maximum possible distance is obtained.

To help the body attain a good balance in the air, the two long jumping styles are used, viz., the Hang and the Hitch Kick. Both help to put the upper body in a backward displacement and although the latter technique is superior in Long Jumping, it is not recommended here, because there is very little momentum left at this stage so that the athlete does not get sufficient time to perform all the correct movements. Moreover, he will be so tired and "tied" up at this stage that he will not possess the necessary muscular coordination to perform the necessary movements correctly and benefit from them.

That leaves the athlete with either the sail style or the "Hang". Most athletes use the former, while the Hang is very common among the Japanese jumpers. Mechanically, the Hang is the better style to use, because it does help to give a backward displacement to the body, and if performed well, as do the Japanese and some of the Australian jumpers like Avery, it also slows down the flight through the air, by a longer upper body. However, da Silva seems to have a style of his own, which appears to be a kind of Hitch Kick. He does get very good results from this style, most probably because he is using his stronger leg for the Jump phase.

In the Sail style the jumper brings his left leg through, knee leading the movement very sharply just as the long jumper does on his take-off. The right arm is swung forward and up with a vicious uppercut action to coincide with the action of the left leg. Then the take-off leg moves up and forward to join the landing leg while the left arm which has moved back flexed to a point just behind the body now moves forward, and the right arm moves down. The jumper is now holding a position with his body leaning forward slightly, legs extended in front, flexed at the knees, and arms hold in front of the shoulders. Landing is then made in this manner, with the legs which have been flexed being extended at the very last moment. The legs are, however, dropping lower all the time and so a poor landing position results.

In Scherbakov's style of "Stepping" the arms are in a better way to coordinate with giving left to the Jump, and to coincide more with the Hang technique. Both arms are behind the body as the landing is about to be accomplished after the Step. The arms are already moving forwards simultaneously as the landing is made. This forward driving movement is cooperative to the whole body action taking place on landing. As the

arms move down to go forward, the shoulder girdles are depressed and relaxed and this wave of relaxation continues to the hips. The body is relaxed with the right knee at its deepest flexion as the arms reach a position by the side of the body.

As the arms start to move up and forwards, slightly flexed at the elbow, the explosive extension of the right leg occurs, and the knee straightens, driving the body forward and up. The left knee has, of course, been swung up, knee leading the movement. The arms move up until they reach a position behind the head. They are still slightly flexed. The take-off leg moves forward and up and flexes on the way up, while the left leg, which was forward with the thigh parallel to the ground, moves down to meet the other leg. They both meet in a position directly below the body which is upright, and the lower legs are flexed. Thus, the thighs are almost in vertical alignment with the body. This type of Hang style is commonly used by the Japanese jumpers with one change with regard to the arm action.

Instead of swinging the arms to a position above the head via the manner just described, the Japanese swing the arms to that point by raising them from behind instead of from the front. This has the effect of bending the upper body backwards which thus helps to give a backward displacement to the body. One has only to try doing this, i. e., raising the arms to above the head from behind to see that the upper body also goes back while the chest is raised. They also try and look at the sky while doing this, because the head is the rudder and if the jumper is looking down at the ground, then this will have an effect on the rest of the body, especially the upper section. Avery of Australia also uses this method of the Hang. The jumper then tries to maintain this position in the flight through the air for as long as possible, bringing forward his legs at the last possible minute, for the landing.

## THE LANDING:

The aim should be to land with the legs as far in front of the body as possible without falling back. The landing is quite important and as much as 9 inches may be gained from an efficient landing. In the Sail style nothing can be done to obtain a good landing position because the jumper is already in the landing position when he travels through the air. But in the Hang, it may be achieved.

In the Hang style too often the jumper lands much too soon. Before the highest point of the jump is reached the jumper has already prepared to land by moving his legs forward, and the arms downwards. This pulls down the body to some extent and once this happens, the legs fall earlier and a quicker landing is forced. But if the jumper remains in the upright position for as long as he can and then at the last possible moment he whips his legs forward, flexed at the knees, he gets his legs out at the right time and so distance is added which otherwise might have been lost.

As for the actual landing positions, the jack-knife one appears to be the one most commonly performed. This is usually the result of too much movement of the upper body forward. A landing position in which the whole body is extended slightly seems more advantageous, but the general argument against this type of landing is that it has two very big disadvantages, viz: 1) when landing in such a position the upper body is so far back, behind the knees and feet, that the jumper will invariably fall backwards on to the sand

pit: 2) so in order not to fall back the jumper would thus have to touch down earlier than the jack-knife style and therefore would nullify the advantage of getting the feet further in front of the center of gravity, which is the criterion of measurement.

I feel that the main consideration in using such a landing position is the question of timing, just as timing is also a very important factor in the Hang style, as to when to bring the legs forward for the landing. As soon as the legs touch down the person using the extended position must be ready to flex his knees immediately, and to throw his arms forward in order to help the upper body to move over the knees, pivoting over them. Very strong abdominal contraction is required for this. My best jump is 49 feet 7 1/2 inches and at the same match that I did this, in my last and sixth attempt, I tried landing in the extended position as described above. But I had just finished running a race over 220 yards and so I was quite tired. However, I touched down with my feet at just over 51 feet. I had never used this method before and so my timing was completely off. I fell back on the sand. If I had been mentally prepared I might have thrown my arms forward and flexed my knees as soon as my feet touched the sand, and it might have been a successful jump. However, this is a technique worth looking into and given further experimentation along practical lines.

## MECHANICS AND MECHANICAL PRINCIPLES

The triple jump, like any other event in athletics, is based upon certain established laws of physics and mechanics, and unless the jumper complies with these he will not be able to do justice to his potential jumping ability no matter how fast or strong he is. The important mechanical principles which are fundamental to this event are as follows: -

Path of Center of Gravity: Once the body is airborne after the take-off the athlete's center of gravity follows a certain path and no matter what he does in the air with his body, he cannot change the flight path of this c. of g. It follows a parabolic path in the air. The athlete cannot increase the length of this curve but he can avoid making a premature landing which would reduce the distance that he would have travelled.

Rotation: Because of the take-off when the athlete has his center of gravity in front of his take-off foot his upper body tends to perform a somersault in the direction in which he is travelling. So if he is leaning too far forward with his trunk at the momment take-off, this take-off position will help to increase the tendency towards forward rotation. But if he keeps his body upright, he can offset this tendency.

Action and Reaction: While the athlete is in the air, every movement that he does results in another movement equal to the first one but in the opposite direction. Thus, if he moves his legs forward while in the air, his upper body will move down towards his legs.

Angle of Projection: This is the angle at which the center of gravity is pro-

jected at take-off. The ideal angle for projecting missiles is 45 degrees, but with triple jumping this is not advantageous in the first two phases. Moreover, with the speed that he is approaching it is not possible to hop with the center of gravity projected at that optimum angle. But it is quite clear that if the take-off angle of the center of gravity is only about 15 degrees in the hop or any of the other phases the athlete will not be able to obtain much distance in that particular phase.

Take-off velocity: This is the resultant velocity that the jumper has attained in his approach run. The faster it is, the further he will be able to jump, provided, of course, that he has complied with the other mechanical factors. Thus, take-off velocity and angle of projection of the center of gravity decide how far the athlete will be able to travel after take-off.

Angular momentum: This is the conversion of the horizontal momentum resulting from the approach run by the vertical spring at take-off. Once the athlete leaves the ground with a certain amount of this angular momentum, it remains with him until he makes contact with the ground again. It can be transferred but not destroyed. Angular momentum is the product of two components: - angular velocity and moment of inertia. So if we decrease the one we automatically increase the other.

Eccentric Thrust: This is the thrust in an off-center direction. It comes into play in triple jumping at each take-off. If the jumper takes off without making any alteration in the correct placement of his take-off leg he will do so with some amount of eccentric thrust. This is because each leg due to its attachment at the acetabulum, is at the side of the hip and so unless the jumper tries to take off with the foot directly below his center line he will not move foreward in a straight plane; that is why beginners, when watched from the front by a teacher, can be seen to be taking off in a lateral plane. So instead of moving up into the air from the take-off in a direct straight line he will move to the left if he is jumping with the left leg.

The Moment of Inertia: Inertia means the amount of force necessary to produce acceleration in an object or body which need not be stationary and so can be already moving. The actual amount of force is the product of the mass and its distribution, and this distribution of the mass is known as the moment of inertia. Taking the whole mass as one unit, it has been calculated that the various components of the body have the following percentages of the whole mass:

| | |
|---|---|
| Head | .07 |
| Trunk | .427 |
| Upper arm | .034 |
| Lower arm | .023 |
| Thigh | .116 |
| Hand | .008 |
| Calf | .053 |
| Foot | .018 |

Thus we speak of a greater or a smaller amount of inertia of a certain body, and so if the moment of inertia of that body is smaller then less force will be required to stop or to start it in motion. If two bodies of equal weight are in flight with one having a greater

moment of inertia than the other, then the one having the smaller moment of inertia will move faster through the air, because of the increased angular velocity.

Bearing the above points in mind let us examine the technique of some triple jumpers. Since momentum for the jump comes from the approach run and momentum equals mass times time, then the faster he can run, the more horizontal velocity he will attain which will be transferred into the jump at the take-off.

THE HOP:

Take-Off: The jumper does not want to gain maximum height at the expense of loss of momentum and so he does not strive for an optimum projection angle of his center of gravity at this take-off. The more he leans back at the take-off the greater will be this angle of projection, just as the high jumper leans back at his take-off to jump vertically. So the triple jumper can afford to run off the board, but in actual practice he tries to run off the board with his body vertical to the ground. So he gets the benefit of a good take-off without keeping his angle of projection too small which will mean a small hop.

Another reason for his trying to take off with his body vertical to the ground is that by doing so he keeps his upper body upright at the actual take-off. So although his center of gravity is ahead of the take-off foot take-off, his upper body is upright, and this will mean a lesser tendency for his body to succumb to forward motion when in flight; the beginner however, does not get this upright position of the upper body at take-off, and the result is that his body has a greater tendency to perform a somersaulting action in the forward direction in flight.

Flight in the Hop: The jumper strives consciously all the time from the moment of his take-off to keep his body upright in the air. He uses his arms and his head to help in this. His leading leg which has driven up at the take-off must swing back while the hopping knee and leg are being brought through. If he swings the leading leg back straight, while bringing the hopping leg through bent, the greater moment of inertia is one as against the other which is flexed will bring about a backward displacement of the upper body which the jumper wants to avoid. So both legs are moved flexed to cancel off any effect which might produce a reaction in the upper body. The arms are moved in conjunction with the leg action in order to balance it. Since the moments of inertia in the legs are greater than those of the arms, the arms are therefore straight, one backwards and the other forwards.

Landing in the Hop: Just before the actual landing occurs, the jumper is moving down to the ground with his hopping knee flexed and high, his other leg trailing well behind the body. This trailing leg helps to keep the jumper's body weight behind his landing leg. To balance this, the opposite arm is also trailing his body and kept straight in order to have as great a moment of inertia there as possible.

The take-off for the Step is dependent on the Hop landing. So if the jumper lands with his body weight too far in front of his hopping leg, then he will not obtain a good take-off. The reason is that by the time that his hop leg has flexed and straightened,

his body will be so far in front that his center of gravity will likewise be in a similar position and the further the center of gravity is ahead of the take-off foot, then the smaller will be the projection angle. So by landing with his body weight slightly behind he is thrusting his landing leg (take-off leg also, in this case), in front of his body. So by the time that his hop leg has flexed and extended again for the take-off for the Step, his center of gravity will have moved in front of the take-off foot, but in this case it is not too far in front. This means that the more the jumper can land with his body weight behind his hop leg, the greater will be the angle of projection of the center of gravity and consequently the further the distance he will travel. But this throws a tremendous strain on the ligaments and tendons of the joints of the landing leg, and some jumpers have broken their legs in this manner.

The Step Take-Off: This is the weakest phase of non-expert jumpers. They usually cover only a very short distance in the Step, and the reason is always the same - the result of a bad and mechanically inefficient hop landing. As described in the previous paragraph, the center of gravity of the jumper is so far in front of his take-off foot that the angle of projection is small and the athlete cannot be expected to cover a great distance. If the angle of projection of the center of gravity is small then the flight path will be a shallow parabolic curve and hence the distance travelled will be short.

With a first-class jumper he tries to get his body weight as far back as he can in the hop landing so that he can obtain an angle of projection of his center of gravity which is nearer 45 degress than 25 degrees to enable him to cover as much distance as he can in the Step. His trunk is upright at the moment of take-off, again with the object of lessening the tendency of the upper body to succumb to forward rotation.

Step Flight: As soon as the take-off has been accomplished, the jumper draws his take-off leg to a point beneath his body where it remains flexed. The front legis held with the thigh parallel to the ground and the knee flexed. From this position the jumper is in a position whereby he can effect a sound thrust at the ground in the landing, for the jump take-off. The arms are held just away from the body, straight to balance the leg actions.

Another version of this step flight is the one usually performed by the Russian jumpers, and Kogake, the top Japanese jumper in 1956 and 1957. They bring both arms to the rear in the middle of the flight and so are in a more sound position to effect an upward lift in the Jump take-off when they have landed from the Step. Moreover, by keeping the arms in the rear behind the body, they also help to keep the body weight behind the body and thus are more able to obtain a much more vertical take-off in the Jump. However, Scherbakov has his own version of the Step flight. He has the longest Step in triple jump history - 17'3". He brings his Stepping knee high into his chest, thereby causing a reaction in his upper body, which of course ceases to remain upright and instead moves down to meet the knee-action and reaction. Thus, because of this forward inclination of his trunk in the Step flight, Scherbakov does not have much of his body weight behind his landing leg and he overcomes this by stretching his landing leg well in front of his body. Being tremendously strong in his legs he is able to do this.

Step Landing: This time the take-off is for the last phase and so the jumper

tries to get the optimum angle in which to project his center of gravity at the take-off. He has, therefore, to take off as near to the 45 degree angle of projection as he can. So he has to land in a position with his body weight well behind his landing leg. One leg and arm or arms are trailing behind just before the landing takes place.

Jump Take-Off: The jumper's main concern now is to obtain as much height as he can. So his whole body cooperates toward achieving this. The take-off now is similar to the Long Jump take-off. The chest, arm or arms and leading knee all react in one singular effort for maximum drive up. He does not worry any more about trying to keep his body upright at take-off as this will, to a certain extent, keep down the upward drive. The result is that there is now more tendency in the upper body to rotate forwards, and so the jumper, once he is airborne, tries to counteract this forward rotation by either using backward displacement in the upper body, e. g. by means of a hitch-kick action, or by slowing down this forward rotation by increasing the moment of inertia of the whole body, e. g. getting into a "hang".

Jump Flight: This can be either in a "hang" position which tries to slow down the forward rotation, or the jumper performs a hitch-kick with the intention of causing a backward displacement in the upper body, thereby fighting the tendency to rotate forward. But most beginners or mediocre jumpers, and even some international class jumpers, still do a "sail" in flight. This does not in any way help to fight against forward rotation, as the jumper is in a "bunched" position in the air and since the moment of inertia is small, the forward momentum is greater than either in the "hang" or the hitch-kick.

Jump Landing: The hitch-kick gives the best landing position as the upper body is slightly behind the body with the legs well in front. The jumper will therefore land in a position whereby his legs will be in front of his body and, of course, his center of gravity and with his trunk in a vertical position. The "hanger" will also be able to attain a similar position, but the point of foot contact and his center of gravity will be nearer because in changing from the "hanging" position in the air into one where his legs are in front of his body, he will have caused some reation to the trunk which will move down automatically towards his legs. He can, however, reduce this tendency by bringing his legs forward with the knees bent thereby reducing the moment of inertia and causing less reaction from the opposite direction.

In the "sail" position, the landing when made is less than what it ought to have been. The feet make contact on the sand and the distance from this to the center of gravity is even less; in fact, the least of the three, thus showing the inefficiency of this jumping position. This "shortened" landing position is caused by the faster forward rotation of the whole body through the air, pivoting about the axis of the center of gravity. That being the case, the body is not vertical, as it is quite forward, and thus the legs cannot get out well in front of the body.

However, in spite of the obvious advantage of the hitch-kick in helping the jumper to attain a sound and efficient landing position, it is seldom used by triple jumpers for the final phase. The reason is that with so little forward momentum left after the completion of the two phases, the athlete will thus be spending less time in the air than he normally would in a long jump, and so he will not be able to execute the proper hitch-

kick movements. Muscle coordination also at this stage is difficult because of the strain and "shock" sustained in the previous phases. So the normal style used in the jump phase is either the "hang", or the "sail", or a combination of the two. But da Silva, the present world record holder manages to use a form of hitch-kick movements and in that way obtains a very efficient landing position. His case is, however, an exception.

## TRAINING

It is difficult to outline a training program for every single jumper, because every athlete is a different individual. What may suit one athlete may not be suitable for another. But in training there are certain underlying fundamentals which must be complied with by the jumper, no matter what sort of training he carries out. For example, he needs to be strong, and there are several ways of getting strength. As long as he uses the overload principle progressively in his attempts to gain strength, then he will be justified, no matter what methods he is employing to obtain this strength.

The training a triple jumper has to undergo depends on the necessary requirements for the event. Once he has an idea what the event demands he can then plan his training so that he can meet with those demands and so have as few weak points as possible.

1. This event is fairly strenous and so the jumper needs to be strong in his whole body, especially in the following regions of his body: the legs, which include the knee and ankle joints; the abdomen and the back. He needs strong arms and shoulders too, because he is doing some very fast work over 40 yards or so in his run-up.

2. Since speed is such an essential factor in the triple jump, the athlete obviously requires some sprint training in his program in order to be able to move fast and efficiently. Training will not improve his basic speed to a great extent, if he is not endowed with this, but at least it will help him to use whatever natural speed he has, in the most efficient manner.

3. Technique is very important in triple jumping. If he is to get the maximum distance out of each phase, the jumper must therefore do lots of jumping in order to get his technique as near perfection as he can. The better a technician he is the more able will he be to make use of the underlying mechanical principles to help him gain maximum distances from each phase.

4. The event also demands some endurance. The athlete has to run up to the board from a fairly distant mark and then he has to make three take-offs. So his training must include some training along these lines -- of getting some muscular endurance and some on cardio-vascular lines.

5. In the run-up, the stride must be as consistent as he can make it. This will then ensure that he hits the take-off board without any bother or worry which will then allow him to concentrate on the whole jump and not on the hop-take-off. So he must take steps to see that he can obtain a consistent stride.

## STRENGTH TRAINING

I feel that the best form of training for strength is to do weight training. Of course, there are other mediums, but I don't think that they can be made as progressive or as scientifically graded as weight training. The overload principle for strength gaining is the basis of weight training. An ideal schedule cannot, of course, be laid down because of individual differences in each of us, but again the general principles can be made clear as to what sections of the body to develop. There are other ways of doing weight training for the parts of the body that I am going to mention as regards the individual exercises, but this is what I would like to recommend.

1. Split Snatches - Besides being a strength developer for the arms and shoulders (triceps and deltaoids), it also brings into play the legs in the alternate splitting action and therefore will have some effects in this direction. The athlete, however, is recommended to split alternately, so that he uses both legs in the front and rear splits. Another point of favour is the speed factor. This exercise is the fastest in the whole weight lifting business. Speed therefore means a very quick moving of muscles, and that, when one is shifting a heavy weight, demands muscular power. It is one thing to be strong, and another to be powerful, i. e. to be able to use the strength in a very fast muscular contraction.

2. Bent Arm Pullovers - This exercise helps to strengthen mainly the triceps and to a lesser extent the pectorals. I prefer this to the one done standing up, because one gets the benefit of using other muscles also.

3. Overhead Squat - This exercise is a deep-knee bending exercise, but carried out with the barbell overhead with the arms in an extended position. It strengthens the lumbar region of the back which is often little exercised, but which is very important in triple jumping.

4. Bench Presses - This activity helps to develop strength in the arms, shoulders and the pushing muscles like the pectorals and the serratus anterior. The arms are quite important in triple jumping as they help to maintain balance in flight and on the landings and take-off. Besides, they help to give "lift" in the Step and Jump take-offs, and so they should be able to move vigorously.

5. Squats or Deep-Knee Bending - This is the most important of the strength training activities, because the power of the legs are the main consideration in this event. I don't advocate a "full" squat because of the inevitable "rounding" of the lower back at the end of the downward movement. Moreover, in real triple jumping, the legs do not bend so much. Thus, a half or three-quarter squat position is much better with the knee flexion never going beyond the angle of mechanical disadvantage. I believe that as much strength is developed in this manner.

6. "Bouncing" Squats - In this form of squatting, the athlete handles more weight than in the other form of squat exercise. One might describes it as a quarter squat activity. The emphasis is going down with the knee in a slight flexion, and then vigorously extending the knees to push the weights up. It should be done at a rhythm

so that the flexion is followed immediately by the extension, as would happen in jumping. The feet remain firm on the floor all the time.

7. Abdominal Sit-Ups - This can take several forms and I think the athlete should do at least two different kinds. The weights, usually discs, are held behind the neck. The simplest form is to do sit-ups on the floor, with the feet hooked under the wall-bar. In all these forms the abdominals work statically, except in the last inner range of trunk flexion, when they work concentrically. Sit-ups on a bench increase the range as the athlete has now to flex his trunk from a sitting position at a point right behind him with his head touching the floor. It is harder, of course, and throws more work upon the abdominals and the iliopsoas muscles. In both sitting positions (on the floor and on the bench) he should also work the external and internal obliques by going down to the right and then to the left. A third form is when the athlete "hangs" down from his feet on an inclined bench. Here the quadriceps, especially the rectus femoris also come into play, which I think is useful. A fourth way is to use "Iron Boots". The athlete sits on a stool or a chair so that he can stabilise himself with his hands holding on to the sides of the stool. He then does leg raises with straight legs after having brought them up flexed to his chest, with the knees touching it.

8. Arm Curls - This exercise is to develop the biceps of the arms, with the aim of balancing the development of the triceps. It can be done with a barbell or with dumb-bells, one in each hand.

9. Rise on Toes - The aim here is to strengthen the ankle joints and to develop the calf muscles which are important in take-offs in the jumping events. The barbell is on the neck while the feet are placed on a brick with the heels on the floor. The athlete then rises on his toes as quickly as he can and returns to the starting position slowly. The starting position described is to increase the range of planting flexion movement.

10. Back Extension - The lower back, so easily injured in jumping, is strengthened in this exercise, which has the athlete lying prone on a bench so that his upper body is over the edge. He is, in fact, lying down on his pelvic section. He commences the exercise with his head just above the floor, and then hyper-extends as high as he can. A disc is held behind his head.

Besides strengthening with weights I also believe that static exercises are just as valuable. They have been found to give just as much strength as dynamic activities, and one point in their favor is that they are economical as far as the time factor is concerned. In an experiment carried out in America, at the Springfield College by Messrs. Donald K. Mathews and Rubert Cruse, it was found that this is so. The results of the experiment which was the effect of Isometric and Isotonic Exercises in Elbow Flexor Muscles, as far as strength and time are concerned were as follows:

1. 41 of the 60 subjects in the Isotonic Unit and 44 of the 60 subjects in the Isometric Unit gained in strength.

2. The former group exercised for an average of 120 seconds per exercise on the ergometer, while the latter group had a total of 18 seconds only in performing

the three 6-second maximal contraction.

Of course an athlete can become stronger through his training on the track and through indoor work, but the strength that he can gain in this manner will not be obtained so quickly as by using weights or by methods based on the overload principle. And in athletics, and other physical activities where strength is a primary concern, one cannot wait for the strength to develop slowly. However, I have put in some strength-developing activities in the track and indoor work, which are related to the actual jumping movements.

## TRACK TRAINING

The triple jumper needs to be physically fit and so he has to do some running along endurance lines, because the cardio-vascular system is so important where physical fitness is concerned. He can do this by means of fartlek runs, or doing interval running over distances ranging from 150 yards to 220 yards. Occasionally 330's will also be good. As he gets fitter he can either cut down the time factor, making an allowance for enough recovery, or keep to the same speed and reduce the recovery interval. Since speed is so important, I prefer the first method.

He also needs to sprint, because the more controlled speed that he has in his approach run, the further he will be able to jump, due to the increased momentum. He will, for example, be able to hop further and still have the same momentum left as he had previously with a much shorter hop. So he has to train with the sprinters when they do their starts, or do about 40-50 yard sprints in his training session. In this way he will gain an efficient sprinting technique which I think is fairly important in triple jumping. If his sprinting technique is mechanically poor, then he will be using more energy than he need do so, and he will not be getting as much acceleration as he ought to.

Since his approach run needs to be accurate so that he will hit the take-off board accurately every time, his stride will therefore have to be of a regular length. If the approach run is bad and a hesitant one, the jumper will leave the board with much uncertainty and bad balance which will become more evident as the jump progresses. If his approach run is correct every time, then the jumper can give his full attention to the whole jumping effort. In order to obtain this even stride length the triple jumper has to train over the low hurdles. If he can clear the obstacles with alternate leading legs, it will be even better. One of the best ways of training in this manner is to hurdle over the 220 yards low hurdles, where the athlete has to resort to a stride plan, employing 7 strides, 9 strides or the alternate leg 8-stride rhythm.

All the above training is only a means to an end - to help the triple jumper perform better in his event. But it will not be of any good if his technique is poor. So the jumper has to jump, jump and jump. During the winter and spring seasons, he has to do as much jumping as he can, working on technique all the time. He should triple jump from an approach run of 5 strides, and then as he improves, he gradually increases his length of run-up to 7, then 9 and finally all strides. Even when he starts competing, and he wants to continue working on his technique, an 11-stride approach

is much better than a full run-up, because he can run fairly fast without tiring so quickly as he would with a full run-up.

The triple jumper usually works on his Step. This phase seems to be the weakest in most jumpers, and a good Step makes all the difference between a first-class jumper and a mediocre one, i.e. provided the other two phases are respectable and are not out of proportion to this middle phase. If he has a reasonable Step, then the rhythm of the entire effort will be balanced.

Besides triple jumping practice, the athlete will also have to put in long jumping training, using the weaker leg, more than the other one so as to develop the strength. Most triple jumpers use the weaker leg to do the final Jump phase and so it is a good plan to train this leg, and jump with the same technique as is used in the triple jump, e.g. the "Hang" style. As with triple jump practice, the approach run for the long jump training should be about half the length of the full one, i.e. from 7 strides to 11 strides, depending on the particular athlete.

In practicing triple jumping from a half length approach run, the athlete is doing the skill as a whole which is very desirable. But since it is so complicated, part practices which are related to the whole are also necessary because the athlete can then find it easier to perform the various movements involved as he will have less to think about. So the athlete can practices the part skills of the whole triple jump in the following ways:

1. Hop and Step. The approach run is also the same as that used in the triple jump practice. He hops and then steps into the pit, trying to hold the step for as long as he can. It is a good plan to make the step distance much longer than he would normally use in the whole triple jump effort. An exaggeration is always recommended when one is "weak" in a certain skill, in this case, the step distance and technique.

2. Step and Jump: A shorter run-up, (7 strides) is advisable because of the problem of balance involved. The athlete lands in the pit at the end of the jump. This practice affords him the opportunity to link up the two phases so that there is a continuous blend from the Step into the Jump. It also acts as a counterbalance to the Hop and Step practice. If the jumper practices only the Hop and Step, without the Step and Jump, he might develop the tendency to hop and step well, and then do a poor jump effort, because he has become so used to stopping after the Step into the pit. Another value is the development of the harnessing of the remaining energy by the athlete for the Jump as he does the Step.

3. Hop, Hop and Jump: This practice helps to strengthen the hopping power of the first leg used, by putting in under "pressure". It becomes very valuable when the athlete has learned to flex the knee each time he lands, before taking off for the next hop. In a way this can be said to be "pressure training" for the hopping leg. Of course, there can be an increased dosage, resulting in the athlete doing 4 or 5 hops, but in such a practice, I think the triple rhythm of this event is not benefited.

4. Instead of doing 4 or 5 hops into the pit, the athlete will be far better off strengthening his legs, hopping 100 yards. He uses both his legs in this practice, but

if he is weaker in one leg then he should use that leg twice as much as the other one. The way the hops are performed is of importance, if the athlete is to get full benefit from this practice. The leg doing the hop should be brought up each time, with the knee flexed so that the knee reaches hip height at least. The criterion is not in hopping high, but in bringing the hopping knee high each time, and flexing on the landing before taking off for the hop again. The athlete should be able to feel his hopping leg land, flex and then extend again for the next hop. He will experience great difficulty at first when performing these "high" hops, and only constant practice will help him to acquire both the strength and skill of hopping in this manner, in this practice and in the triple jump.

5. Steps. Since the Step is the weakest phase in most jumpers, a part practice along this direction will be of importance in helping the athlete to succeed in getting a reasonable Step in his hop, step and jump. It consists of the athlete doing big, bounding Steps using both legs in the take-off for a distance of 100 yards. He brings up the knee of the leading leg up high with the leg flexed at the knee, so that the thigh is parallel to the ground. He then holds this position as long as he can, before extending this leading leg in the landing for the next Step. He uses his arms vigorously swinging them forwards and backwards to help in the lift as well as in the balance. He swings the forward arm flexed slightly, and the rear arm back with it extended to help give more power through a longer leverage. A variation of this is when the athlete is using the Scherbakov style of Stepping. The jumper swings both arms forward as he would do in the Step phase of the triple jump when he is Stepping with the correct leg, i. e. the leg that he would normally use in performing the Step in the whole effort. When he resorts to this practice, the other leg will have to take a shorter step to compensate for the slightly longer Step which would result from this practice. The jumper "floats" forward in the Step, but before he lands he has to swing both his arms to the rear.

In addition to the above methods of training for technique and for the development of strength in the legs, any form of jumping is good for the legs. Some athletes jump and hop with weights tied round their waists to increase the load that their bodies have to be called upon to deal with. They feel that when the weights are removed when they compete, the sense of lightness is at once feltmand the body will react by an improved performance. Money, of Canada, who was 5th in the High Jump with 6 feet 7 3/4 inches at Melvourne, used this weight-round-the-waist idea of training. A triple jumper who also makes use of the same method is Iimuro, of Japan, who earned a sixth placing at Helsinki with 49 feet 2 1/4 inches.

Then there are athletes who hop over hurdles set at 2 feet 6 inches or 3 feet. The hurdles are about 8 yards apart. The athlete hops over each hurdle and takes three hops in between the obstacles. An athlete who trains in this manner is Ken Wilmshurst of Great Britain, who was placed 9th at Melbourne with 50 feet 11 3/4 inches. In order to improve the Step by making the jumper step higher, some coaches place a low hurdle between the Step take-off and the pit when the athlete is practicing the Hop and Step skill. The hurdle must then be placed nearer to the landing in the pit than to the Step take-off. Richard Ganslen, one of America's leading triple jump coaches recommends this method of training for the Step. So does Dennis Watts, the National Coach for the North in Great Britain.

## INDOOR TRAINING

In a country like England where the weather is apt to be very wet and the ground conditions almost impossible for jumping at certain times, some indoor training along triple jump lines is essential. The training must have some relation to the event, and must also help to strengthen and develop the jumping muscles of the legs. It is not enough to do weight training when the outside conditions are unfavorable. It is necessary also to triple jump. The following are ways in which the jumper can make good use of the gym when he cannot jump on the track.

1. Triple jumping on rubber mats placed along the floor of the gym. In order to lessen the shock of landing on the hard gym floor there should be at least two mats at each place of landing. The only disadvantage in this practice is that a proper landing from the final jump phase cannot be executed, i. e. a good leg shoot. Nevertheless, this practice does afford the jumper the chance to triple jump.

2. Hop and Step. This is to develop the Step skill besides coordinating the two phases. But this time the jumper after hopping on to the mats, takes off for the Step on to a vaulting box, landing on it. He starts with only one section of the box, and as he improves, he increases the number of sections. This will help the athlete to "jump" high in the Step take-off.

3. Triple jumping, commencing from the top of a vaulting box. The jumper stands on the edge of the box and then hops down on to the mats. He flexes his leg on landing and then continues into the Step and Jump. As he improves, i. e. as his hopping leg increases in the ability to take the shock of the landing from the box, he puts on another section of the box, until he has put all the sections on. Just as in the Hop and Step with a box, he begins with only one section. If his leg is not strong enough, it will collapse on the landing. This method of training will help the hopping leg to develop strength in the tendons of the knee so that it will not collapse in a full effort jump and also to increase the ability to take the landing jar. As strength increases, the athlete will find that he can land from the hop, flex the knee and then take off for the Step.

In training, whether indoors or on the track, I consider technique workouts or training, the most important principle. The athlete has to work on his technique all the time, doing the same thing over and over again, until he can do the various complex movements involved automatically. He must, as it were, "groove" the muscle-nerve paths which are being used so that they have no difficulty in travelling from the central nervous system to the muscle groups in use, and vice versa. In order to do this, the athlete must always consciously think of what he is doing, aiming at perfection in his technique. He must not be content to go out on the track and merely triple jump until he is tired, but to aim at a particular point in his technique every time he makes a jump. Occasionally he can indulge in a little competition, either with himself or with other triple jumpers.

## TRIPLE JUMPING RATIO WITH CORRESPONDING DISTANCES

| 6:5:6 Ratio | | | 10:7:10 Ratio | | | 10:8:9 Ratio | | |
|---|---|---|---|---|---|---|---|---|
| 30' - 10'7" | x 8' 10" | x 10' 7" | 30' - 11' 0 1/2" | x 7' 11" | x 11' 0 1/2" | 30' - 11'0 1/2" | x 8'10 1/2" | x 10' 1" |
| 31' - 10'11" | x 9' 2" | x 10' 11" | 31' - 11'5" | x 8' 2" | x 11' 5" | 31' - 11'5" | x 9' 2" | x 10' 5" |
| 32' - 11'3 1/2" | x 9'5" | x 11'3 1/2" | 32' - 11'9 1/2" | x 8'5" | x 11'9 1/2" | 32' - 11'9 1/2" | x 9'5 1/2" | x 10' 9" |
| 33' - 11'7 1/4" | x 9' 8 1/2" | x 11' 7 3/4" | 33' - 12' 2" | x 8' 8" | x 12' 2" | 33' - 12' 2" | x 9' 9" | x 11' 1" |
| 34' - 12' | x 10' | x 12' | 34' - 12' 6 1/2" | x 8' 11" | x 12' 6 1/2" | 34' - 12' 6 1/2" | x 10' 0 1/2" | x 11' 5" |
| 35' - 12'4 1/4" | x 10' 3 1/2" | x 12' 4 1/4" | 35' - 12' 11" | x 9' 2" | x 12' 11" | 35' - 12' 11" | x 10' 4" | x 11' 9" |
| 36' - 12'8 1/2" | x 10' 7" | x 12' 8 1/2" | 36' - 13' 3 1/2" | x 9' 5" | x 13' 3 1/2" | 36' - 13' 3 1/2 | x 10' 7 1/2" | x 12' 1" |
| 37' - 13'0 3/4" | x 10' 10 1/2" | x 13' 0 3/4" | 37' - 13' 8" | x 9' 8" | x 13' 8" | 37' - 13' 8" | x 10' 11" | x 12' 5" |
| 38' - 13' 5" | x 11' 2" | x 13' 5" | 38' - 14' 0 1/2" | x 9' 11" | x 14' 0 1/2" | 38' - 14' 0 1/2" | x 11' 2 1/2" | x 12' 9" |
| 39' - 13' 8 1/2" | x 11' 5" | x 13' 8 1/2" | 39' - 14' 5" | x 10' 2" | x 14' 5" | 39' - 14' 5" | x 11' 6" | x 13' 1" |
| 40' - 14' 1 1/4" | x 11' 9 1/2" | x 14' 1 1/4" | 40' - 14' 9 1/2" | x 10' 5" | x 14' 9 1/2" | 40' - 14' 9 1/2" | x 11' 10 1/2" | x 13' 4" |
| 41' - 14' 5 1/2" | x 12' 1" | x 14' 5 1/2" | 41' - 15' 2" | x 10' 8" | x 15' 2" | 41' - 15' 2" | x 12' 2" | x 13' 8" |
| 42' - 14' 10" | x 12' 4" | x 14' 10" | 42' - 15' 6 1/2" | x 10' 11" | x 15' 6 1/2" | 42' - 15' 6 1/2" | x 12' 5 1/2" | x 14' 0" |
| 43' - 15' 2" | x 12' 8" | x 15' 2" | 43' - 15' 11" | x 11' 2" | x 15' 11" | 43' - 15' 11" | x 12' 9" | x 14' 4" |
| 44' - 15' 6 1/2" | x 12' 11" | x 15' 6 1/2" | 44' - 16' 3 1/2" | x 11' 5" | x 16' 3 1/2" | 44' - 16' 3 1/2" | x 13' 0 1/2" | x 14' 8" |
| 45' - 15'10 3/4" | x 13' 2 1/2" | x 15' 10 3/4" | 45' - 16' 8" | x 11' 8" | x 16' 8" | 45' - 16' 8" | x 13' 4" | x 15' 0" |
| 46' - 16' 3" | x 13' 6" | x 16' 3" | 46' - 17' 0 1/2" | x 11' 11" | x 17' 0 1/2" | 46' - 17' 0 1/2" | x 13' 7 1/2" | x 15' 4" |
| 47' - 16' 7 1/4" | x 13' 9 1/2" | x 16' 7 1/4" | 47' - 17' 5" | x 12' 2" | x 17' 5" | 47' - 17' 5" | x 13' 11" | x 15' 8" |
| 48' - 16'11 1/4" | x 14' 1 1/2" | x 16' 11 1/4" | 48' - 17' 9 1/2" | x 12' 5" | x 17' 9 1/2" | 48' - 17' 9 1/2" | x 14' 2 1/2" | x 16' 0" |
| 49' - 17' 3 1/2" | x 14' 5" | x 17' 3 1/2" | 49' - 18' 2" | x 12' 8" | x 18' 2" | 49' - 18' 2" | x 14' 6" | x 16' 4" |
| 50' - 17' 7 3/4" | x 14' 8 1/2" | x 17' 7 3/4" | 50' - 18' 6 1/2" | x 12' 11" | x 18' 6 1/2" | 50' - 18' 6 1/2" | x 14' 9 1/2" | x 16' 8" |

# TRAINING FOR THE QUARTER-MILE

By: Jim Lavery
Indiana University

In my running days I was trained by Tommy Deckard who, in turn, was a disciple of Billy Hays. Gordon Fisher's approach is similar to that of Hays, but with some variations.

The amount and type of training for the 440 depends primarily on the type of man you have. There are three types or classifications of 440 men: (1) the Sprinter, (2) the Middle Distance Man and (3) the Distance Man. This last type would be used in the 440 only to fill out a relay team, so for the purpose of this discussion I will concentrate my attention to the first two.

The sprinter is at his best in the short runs, from 60 to possibly 300 yards. However, if such a boy has the desire and the willingness to work, he can be a fine utility man for your team. This type of runner has explosive power; he can get out at the start, get out of the crowd. His fast start enables him to get good position, thus avoiding the pack and the possibility of getting bumped and knocked around. Sometimes he will be passed around the 300 or 350 yard mark, but he must have the stamina to hang on to the man who passes him. This type makes a great lead-off man. What do you train him for? We feel it is easier to come down than to go up, so we train him for the quarter on 330's. You have to be first or second at the 330; from then on it's guts.

The middle distance type can again be sub-divided, into the sprinter and the strider. The sprinter is definitely a middle distance man; he would have difficulty in going up to the longer races. He may not have the start necessary for a good 60 or 100, but he can run a good 220 and 440. He has many of the characteristics of the regular sprinter, he is able to put on a burst of speed, for example, but he is a hard runner. He looks as if he is working hard all the way. On the other hand, the strider type covers ground easily, he flows rhythmically down the track. Whitfield was a fine example of this type. They have good speed as well as endurance. They can go up to the half and even to the mile.

We feel that the start does not take much out of the runner. Quarter-milers are usually high strung and the first 50-60 yards are run on nervous tension. A good 440 man should explode for the first 60 yards, then settle down into "striding". I call this stride "over-drive". The strider has the ability to run at top speed, or almost top speed, without working hard. He can maintain the speed he has built up without burning himself out. This isn't easy to teach. On our team we use the good ones - like Gaffey and Miller - as examples for the others, like Laconi, who is the sprinter type. The stride should carry them to the head of the straightaway. Then they abandon caution, cut stride and attempt to sprint the rest of the way.

At Indiana, everybody, including the jumpers, works on the cross country course. The kids like it; they lay out a 220 course, a 440 circle and a half mile. After a couple of weeks, they run around for about an hour, then do calisthenics and we have just begun

to use weight training also. As for work-outs, Monday is conditioning day. At Drake we used to run 660 on Monday. Now, with interval training, we do much more, repeat 330's, for example. We still use the 660, but mostly only as a conditioner early in the season. For a change from the 330's we sometimes run 220's with the intervals between gradually cut down. Monday is the tough day. - overdistance. When they get indoors they are ready for hard work, 660's and a couple of 300's. We do not emphasize speed; the emphasis is on relaxation, running as easily as possible. When they do run the 660, in the early season they run the quarter in 55, relaxed, then work the last 220. During the season the 440 relaxed in 50-52, then work the last 220 with emphasis on not tying up and shortening stride. Our objective for 660 is 1:20. We also use 500's and 550 with the quarter in about 50 seconds. I emphasize the last 110 to instill the confidence that they can finish well.

Tuesday and Wednesday are the days for pace work-outs, for example, 6-8 220's with short intervals in between. We may run 6-8 220's in about 24 seconds on Tuesday, and on Wednesday 2 or 3 220's at race speed, from 22.5 to 23. We vary the distances to prevent boredom, perhaps some 120's at times. The programs are planned from day to day and are posted on the bulletin board. They are not rigid, however. If the boy does not agree with the day's assignment we talk it over and it can be changed.

On Wednesday, pace again, perhaps stimulating the first 220 of the race. There is a difference in strategy when the race is to be run in lanes or catch-as-catch-can. We work on starting fast and getting position on the turn. The Tuesday and Wednesday work-outs may be reversed for variety. Interval training allows the athlete to ocover much more ground than longer workouts in one place.

On Thursday we finish up the week's workouts. We work out the meet strategy, simulating the problems which are coming up. We run one curve, or two curves, as the case may be. Starting is important. I like to see them get out fast. We do starts of 20-30 yards on Thursday to tune up their reaction time.

We finish up every day, without definite assignment, by running 110's without the watch. Start slow, move into stride, them boom! - break out for 10-20 yards. We do this every day after practice. The minimum number is 10 and they really get tired. This really helps in the last part of a race.

To conclude, a few words about the distance man. The man who can run up to the mile is trained principally for his own event but we do some speed work and starts on Wednesday or Thursday.

Q. Did I understand you to say that practicing for the 440 will hurt a sprinter for the 100?

A. If you are training a sprinter to run the 440, for the relay, you adapt his workouts more to the 440 rather than the sprint. The average sprinter will lose a little in the 100 but gain in the 220. The work doesn't affect Greg Bell, but Williams is short and stocky and he couldn't produce the same burst of speed in the 100. If he laid off a few days and practiced on reaction and speed, he could come back.

(Werner) I think they lose their fast cadence temporarily.

(From the Floor) I think a man can run 100 on speed but has to be in condition for the 220.

Q. How can you vary workouts for a man in multiple events, especially when you have two meets a week?

A. (by Snyder) Let him jog and stride. He'll do his hard work in meets.

(Lavery) Bell only practices a little on form and did some starting. He'd get plenty of work on the runway. Every day he's go down the runway about 20 times, but when he jumped, it was only after a short run.

(Snyder) Only seldom does a broad jumper have to jump all out. He runs fast on the runway but when he actually jumps, it's pop-ups after a short run. To avoid the danger of injury, we have our men run through on the track at a mark, instead of running through the pit.

# MY VIEWS ON MIDDLE DISTANCE RUNNING

By: Arthur Wint
Jamaica

## INTRODUCTION

One cannot be dogmatic about a subject which is so vast and essentially individual. As one's knowledge of athletics and athletic history increases, the less certain one becomes about things. One can only state principles, and show by illustration how broadly based the fundamentals must be if they are to account for the success of all.

I am inclined to think that the seeker after athletic success, either as a teacher or performer, will get further if he realizes how intensely individual the whole subject is. What we are concerned with is the method of producing optimum results from the human body and in order to do this a perfect understanding of the physiology and phychology - both used in their indirect sense - would be necessary.

Certainly medical science is as yet far from a complete knowledge of either body or mind, and it is along that road that athletic improvement of the future will be gained, together with improved technique.

Each athlete is a law unto himself and one man's training methods or style may well spell disaster to others who attempt unwisely to copy him, simply because he happens to be a champion.

Any sport, in order to get a real hold on a man's affections, must demand mental as well as physical activity and unless one probes into the attendant problems, to merely run and throw things soon becomes terribly boring.

1. An athlete's problems may be divided into two categories. In the first place, he must allow perfect physical fitness - body, mind and nerves trained to top pitch. In the second place, he must study technique - find a style that suits him - acquire perfect pace judgment - learn track tactics.

2. Analysis of running based on my personal experience - not to be taken as a general plan.

3. Each athlete is different, mentally and physically - so no set plan can be applied to all.

4. Running or propulsion in primitive man was the means of escaping from enemies or chasing prey. With evolution and civilization such powers are not necessary and are lost through natural selection. Hence the necessity for such rigorous preparation for all forms of athletics.

Of all animals the only one incapable of locomotion within a few hours of birth is man. Most all movements have to be learned and mental patterns developed as a result of repetitive movements which are conscious at first but become automatic later.

5. TRAINING -- on the track )
-- use of film strips ) help to develop
-- relevant literature )

this mental pattern - strengthen the muscles - increase their mechanical efficiency and increase the reflexes.

6. Intelligent attention must be paid to:

a. Rhythm, i.e., perfect coordination of arms, legs, breathing
b. Economy of effort resulting partly from (a) above, and partly from the elimination of all unnecessary muscular activity, e.g., overstriding, straining neck muscles, exaggerated knee lift, etc.

7. All the above, i.e., coordination, rhythm, economy and stamina, can only be achieved by constant training - repititive running or over-distance running - and as these are perfected, so does the mental attitude develop because, make no mistake about it, the mental attitude needs as much conditioning as the physical condition.

8. Most inportant in pace judgment:

Take 400 m. in 46.2

| | 100 meters | | Total time |
|---|---|---|---|
| Decrease of speed: | | | |
| | (1) 10.9 - 10.8 | | 10.9 - 10.8 |
| + .3 | (2) 11.2 - 11.1 | + .3 | 22.1 - 21.9 |
| + .5 | (3) 11.7 - 11.8 | + .7 | 33.8 - 33.7 |
| + .7 | (4) 12.4 - 12.7 | + .9 | 46.2 - 46.4 |

Eastman lost race because: too fast first 200 m. - rate of decrease of speed too great last 100 m.

To produce maximum speed for total distance, effort must be distributed economically.

No athlete should arrive at the tape all in for the rate of decrease is then at the maximum.

9. In considering the longer races, the above holds good but I have found that I could make use of the reciprocal action of arms and legs. What arms do, legs must follow; so when the legs are getting tired, energy necessary to maintain movement is inefficient. But if you initiate the movements by use of the arms, then more efficiency is achieved. So towards the end of the race use the arms consciously and the legs must follow. Remember the angle at the elbow determines the length of stride - acute angle, short stride - and vice versa.

10. Tactics during the race: Trailing - Passing. Use pace judgment. Know the opponents. Above all, know yourself. Remember it is easier to be chased than to chase.

11. Use each race as on object lesson - be critical - analyse - correct errors in training - listen to the coach who sees what you have done and where you are wrong - remember training is subjective - you just feel that you are doing things perfectly.

12. Diet - well-balanced. No food for at least 4 hours prior to race. Easy on food for at least 2 hours after race.

13. Rest - Adequate - mental as well as physical.

14. Sex - Individual problem - abstinence for at least three days prior to long race.

# RUNNING THE HALF MILE

By: Charles Beetham
Ohio State University

I am pleased to talk to you gentlemen about the 880 yards run. I also hope I will be able to give you something that will help you in working and training half-milers. There have been so many times when I could have used some information myself about half-milers that I don't know why I am up here trying to tell you gentlement. I think this coming year will be a good time to apply what I am going to preach. I know what I would like to do to some of them, but there are laws preventing such a thing as I have had in mind. I also hope I can be of help to the high school coaches, possibly helping them develop a high school champion. We college coaches are not adverse to getting good athletes. That reminds me of a story Dr. Riley Castleman of Ohio State used to tell on himself. He was riding downtown one evening on the trolley. Two young men, college students, were sitting in the seat in gront of him. From their conversation he could tell they were sports fans. One remarked to the other that he saw where Pete Anson had enrolled at Ohio State. (Pete was a great high school athlete and had high-jumped close to 6'3" or better in high school.) One student was telling the other what a great high school athlete Pete was and how high he had high-jumped. The other boy replied: "Yeah, but after that Castleman gets through with him he won't be able to jump 5'6"."

The best in a combination of three factors can enable any boy to achieve his best performance in the 880, or in any athletic event. These three factors are easily recognized and are present, or should be present, in every coaching situation. I want to talk about all three of these factors, briefly about the first two and in some length about the third.

These three things are:

1st - The coach
2nd - The prospect, or boy
3rd - Coaching and training program

Knowledge of a sport does not always make a successful coach. That is just a part of coaching. It is much easier to achieve success if we have the requisites needed to reach a goal. They say it is hard to make a silk purse out of a sows ear. The same idea applies in developing athletes from a performance angle. (Most of us have physical and mental limits and our achievements are limited by these abilities.)

A good coaches' primary job is coaching and teaching. It does not stop there. He assists and guides a boy all through his high school or college career and many times for years after. His application of the psychological and inspirational elements are very important in gaining successful athletic performances. In no other field of education does a person have the opportunity to help boys as does the athletic coach. The many little but important things that go into making us better persons comes from the

associations outside the class room. A coach has a wonderful chance to give boys guidance and understanding.

It is also a coaches' job to encourage boys to attend college. Of course, we urge them to attend our school primarily. I believe though, we all would like to see any fine athlete get a chance to continue his athletic career even if he didn't go to our school. Some coaches may over-emphasize this attending "our school" philosophy. A coach may over-emphasize all other phases of his job and be acclaimed for his great works. As soon as he over-emphasizes "advanced educational training for high school champions" he receives a gread deal of condemnation.

I like to think there is an ideal physical and mental person for the 880 yards run. Few, if any, of us will ever be fortunate enough to get such a person to work with. There are certain qualities, however, that must be present in a boy to make him a good half-miler. He may not have all the things I am going to mention, but he must have all of them to some degree. The better endowed the boy, the better chance for him to break records. The boy who lacks these qualities can still achieve satisfaction from running, but his performances are going to be limited. His great achievement will lie within himself; from physical enjoyment, from competition and from striving to improve his times. The coaches' satisfaction comes from seeing a boy better himself.

I have said that a half-miler is a boy who loves to run yet is too slow to run the 440; too lazy to run the mile; not smart enough to be a manager; knows a great deal more than the coach; drives the coach "nuts" with his actions, but often ends up running a fine leg on a winning mile relay team.

To me there are seven qualities that are important in helping a boy become a good half-miler.

1. Inherent physical strength
2. Fair speed
3. Competitive spirit
4. Mental and psychological attitude
5. Relaxed easy stride
6. Quick pick-up
7. Change of pace

Some of these things can be developed to a great degree, others to a lesser degree.

Training and conditioning for the 880 yards is hard work. Regardless of a boy's ability he cannot run a half-mile wihout training for it. There are many activities where it is possible for a boy to do a good job through sheer ability. He may high jump or put the shot fairly well the first day out. He cannot run a half-mile the first day out.

We have always believed in a good warm-up for every work-out. Whether early, middle or late in the season. The intensity and duration of the warm-up will increase as the runner's strength and conditioning increase. A boy should spend from 30 to 50 minutes on his warm-up. He should start from a very easy jog, through light calisthenics, more jogging into easy striding, more calisthenics including some heavy, from easy

striding into striding and into hard running. Naturally early in the season the warm-up will not include hard or fast running, just as the training during this period will not be hard or fast.

Ideally a boy should do easy running and light striding for at least two weeks before doing any forced running.

A half-miler should do all types of running. Over-distance, lots of striding, sprinting, starting practice, pace running, a great deal of change of pace running, even low hurdling if the boy is capable of learning to go over a low hurdle.

I don't feel a planned program over a period of time is the best way to give a boy a training program. Such a program is not possible in our colleges as there are too many other factors that conflict with his work-outs. I do believe that most boys like to know what is ahead for them. Many like to have an idea what is on for tomorrow, or when are we going to run a time trial, or why don't we do this some time. Larry has always felt, and I agree with him, that normally it's best to decide the work-out when the time comes to do it. By a mutual understanding between athlete and coach, keeping in mind the things the boy needs to work on, the weather conditions, the competition, the best work-out can be determined. However, this is very hard to do with a number of athletes. If a coach had just three or four boys to concentrate on this is wonderful. However, we have anywhere from 15 to 20 up to 50 to 60.

A very practical, yet very flexible, program can be worked out which gives the boy a chance to see what is coming up. It gives him a chance to help decide for himself what to do. It acts as a guide with the coach supervising and over-seeing.

As an example, a possible weekly schedule:

| | |
|---|---|
| Warm-Up | Always warm-up well. |
| Monday | Over-distance |
| Tuesday | Pace running. Work on pace running. Do a great deal of it as the boy gets in better shape. 10-15-20 220's at 880 pace with about 1 1/2 minutes rest between. 4-5-6 440's at 880 pace with 3 minutes rest between. Plan for the boy to run what he can take. |
| Wednesday | Alternate running. Wind-sprints, gassers, fartlek, Repeat 220's hard. Repeat 440's hard. Should be hardest day of the week. |
| Thursday | Pace. Similar to Tuesday. Could work on pace at 440 speed or at mile speed. |
| Friday | Speed. Starting practice, short sprints for time. All out 220's. |

Saturday Pace.

Alternate Running - Can also include what has been called "free play". After warm-up, start out without set routine. Run any distance from 2 to 4 miles. Don't run over 200 yards at any one time at the same speed. Do jogging, striding, sprinting, mixing it up all during the run.

This program will change as competition begins. Let up on work toward the end of the week.

There are several points I would like to comment on before closing.

1. A boy who complains more than several times about sore legs, shin splints, aches and pains will seldom, if ever, reach his potential. All of those things are the expected and should be the accepted part of running.

2. A boy also has to be able to punish himself. He has to be able to put it out. This, I feel, can be developed by the coach. I was a very average runner at best in high school even though I did a great amount of running. (2:10 - 5:30 - 4:55) I feel that I had not yet learned how to run when I began to feel fatigue.

3. Most boys, to be great runners, do what the coach tells them to do, and then do it again.

4. Boys have to run themselves into exhaustion to prepare for a maximum performance.

5. Get your boys acquainted with other events.

6. I feel starting and sprinting is neglected by most middle distance runners.

7. In the 29 years I have been with track and field athletics there has been little or no change in coaching teehniques for the middle distance runs. The things we do today are practically the same as before World War II. The biggest difference is more boys are doing more running now. In the past only a few from each team did a tremendous amount of work.

8. It is hard for me to believe that some of the runners in this country have achieved the great success they have by the training programs their coaches have listed. One of the foreign coaches remarked at the 1956 clinic about the small amount of work our boys did in relation to that of the foreign athletes. That is why I say a boy should do what the coach tells him and then either repeat it or take another work-out.

9. Two important points that should be stressed and worked on whenever possible are learning to stride and learning to develop a fast pick-up and change of pace.

10. Due to the athletic set-up in this country; primarily college competition

after high school, school work, vocational interests and our way of living, it is impossible for me to train a half-miler the way I would need to for him to reach his top performance. (That is the one thing that foreign coaches and athletes have on us.) I don't want you to feel that our athletic set-up is not good. I believe that in college it should be making athletes from the students, not students out of athletes.

Remember to emphasize:

Regularity of work-outs.

Training for the half-mile is a long-term proposition.

"Nervous panic" before a race.

# RUNNING FORM

By: Fred Wilt
Former National Mile Champion

Form is strictly an individual proposition. The form of every runner must, by reason of individual difference in physical make-up, be at least slightly different from the form of every other athlete. It's true all humans may have the identical muscles, but each human differs from every other in at least some minute way in height, weight, bone structure, length of muscles, size of muscles, difference in muscle attachment, etc.

Good form can be described only in general terms. Every athlete must have an individual form perfectly suited to himself. It's an error of the highest magnitude to attempt to copy the running form of another.

Body Angle should ideally tend toward the perpendicular. Never should the runner have a body angle which allows him to lean backward. A very slight forward lean may be necessary to overcome wind resistance.

The Arm Action plays the role of a balance mechanism. As the right leg goes forward during the stride, it tends to throw the right shoulder forward, and the left shoulder and left side of the upper body backward. The left arm comes forward, around the body, in a reaction which acts to counteract the action of forward right leg. It matters not (practically speaking) whether the arms are held high or low, so long as they're comfortable and devoid of unnecessary or unnatural tension in whatever position they're held.

One method of determining if the arm position or carriage is correct is to ask if the arms get tired quickly or ache while running. If the arms tire quickly, then they're being held in an incorrect position for the individual athlete in question, causing tension and eventually fatigue - which shouldn't come more quickly than general body fatigue.

The arm action must be a natural movement, and must add rhythm to the running position. The hands are held relaxed, don't flap in the breeze, and are not clenched like a fighter's fist. Most runners hold their hands in a relaxed "cup" position.

The arm action should be around the body in a forward direction, and should add to the running progression, rather than detract from it, in its role as balance mechanism. The movement of the arms shouldn't include any irregular oscillation, jerky motion, disharmonious action, irregularity, or ragged, uneven, jagged motions which might detract or in any way impede forward progression.

The arms come forward with each step toward the plane of a line extended from the navel to the nose. Rarely does the hand or arm cross this plane, as this too would result in side motion which would have the same effect on smooth running as a loose wheel, wobbling about, would have on the speed of an auto. Briefly, the arms move around the body in running, not away from the body.

Generally speaking, the head is pointed directly to the front, bent neither forward nor backward. However, if individual differences cause an athlete to run with his head high, and he's uncomfortable any other way, then by all means allow him to do so - providing this head position doesn't cause the athlete to lean backward or otherwise decrease his speed.

Stride Length has been a matter of widespread misunderstanding. The fact of the matter is that the slower the speed of the run, the shorter the stride. The faster the run, the longer the stride. The sprinter has the longest stride, and the marathon runner the shortest stride.

Percy Cerutty of Australia has described "overstriding" as one of the two biggest crimes in running. Two short strides will carry the runner father than one long stride, and the two short steps take perhaps twenty times less energy than one long stride.

Thus, contrary to popular belief, the sprinter (who isn't necessarily concerned primarily with maximum economy of stride motion) takes the longest step within reason, whereas the runners in longer races (wherein economy of stride motion is a paramount consideration) take a natural step, not exaggerated, not long, not short, but a natural step in keeping with maximum economy of effort for the running speed required.

The Leg Action prevents the body to a certain extent, and energy must be wasted in lifting the body an extra distance while at the same time pushing the body forward.

As the running motion continues, the forward foot moves toward the track in a downward, backward, "stroking" motion (not punching or pounding), and the outer edge of the ball of the foot makes first contact with the track.

Immediately thereafter (the smallest fraction of a second later), the heel touches the track without reservation and momentarily bears the full weight of the body as the runner rides smoothly forward for the next stride.

At this point, when the foot is (momentarily) completely flat on the track with the heel bearing the full weight of the body, the foot has come to a complete stop for the slightest instant. Then, as the body weight continues to ride forward, the heel first is lifted, and finally the toe leaves the track for the next stride.

## TOM MURPHY vs. WILLIE ATTERBERRY

No. 1 — Excellent example of maximum extension of toe, ankle, knee, and hip at conclusion of stride. How often have you heard the instruction, "Get up on your toes!" Doesn't this really mean push off at conclusion of stride with maximum force, rather than run on the toes?

No. 3 — It appears that heel is contacting track before ball of foot in both instances. But this isn't the case; ball does touch running surface prior to heel. Good example of uninhibited form.

No. 4 — Heels are apparently still in contact with track, though body's c. g. is rapidly passing forward. Note that heel of recovery leg comes up near hip in each athlete's form.

Nos. 5 -6 **Almost identical to 1-2, respectively!**

No. 7 **Another example of perfect foot drop wherein outer edge of ball and immediately thereafter heel touches surface directly under center of body's mass, while heel rides high in recovery stride as body angle tends toward perpendicular. Irrefutable evidence by such great athletes proves that this is correct foot plant and demonstrates fallacy of "toe running."**

No. 8 **C. G. has passed beyond foot touching track and heel has lifted slightly from track and will continue to do so until final push-off thrust.**

The body is propelled forward with maximum force or leverage only if the heel has touched the track without reservation, as illustrated in Figs. 5 & 11, so that maximum extension of the ankle and toe can be made as the toe leaves the track (Figs. 1, 7, 12, & 13).

It is thus readily evident that any running, especially sprinting, which doesn't permit the heel to touch the track with each step, robs the runner of maximum leverage. This explains why Percy Cerutty, coach of the great Herb Elliott, regards toe running (without use of the heel at any time during each stride) as the second biggest crime in the running movement.

## MAXIMUM THRUST

As the toe leaves the track with maximum thrust at the conclusion of each stride, the heel of this foot rises high (toward the hip) from behind (Figs. 2, 3, 4, & 5), giving evidence of a terrific thrust. The faster the run, the higher toward the hip will be this kick-up behind at the conclusion of each stride.

This "kick-up behind," contrary to popular belief, isn't a fault, and is actually an aid in shortening the lever of the leg (Figs. 5 & 11), permitting the shortened leg lever to swing forward more quickly in a pendulum action for the next stride (Fig. 4, 5, & 6).

The contact of the foot with the track is quite short in the running motion and is immediately followed by a period when both feet are off the track - after the back foot leaves the track, and before the front foot makes contact with the track - as illustrated in Figs. 2, 3, 4, 8, 9, & 10.

As the back leg moves forward in a pendulum motion with each stride, the knee is swung up and forward as it approaches the front (Fig. 6). The faster the running speed, the higher the knee lift (maximum knee lift in sprinting); and the slower the running speed, the less the knee lift (minimum knee lift in jogging).

After the back leg has passed the leg touching the track during the pendulum action of the rear leg as it goes forward for the next stride, the lower part of the recovery leg flows forward as the knee continues upward and forward (Fig. 7).

After the knee reaches the front following the forward-upward motion of the recovery stride, this knee is pushed in a downward direction toward the track (Figs. 8, 9, and 10). The lower part of this leg stops when almost straight with the upper leg (Fig. 10).

Then, the motion previously described is repeated, and the front foot in the stride again moves toward the track in a backward, downward, stroking movement permitting the outer edge of the ball of the foot to touch the track first, followed immediately by the heel (Figs. 10 & 11).

## CONTINUOUS LEG ACTION

Thus the leg action is continuous in running, similar to the lever on the driving mechanism of your watch, and the body is propelled forward by the forces of leverage produced by knee, ankle, and hip extension. Running progression results from these forces pushing behind the center of gravity of the body, and isn't, cannot, never was, and never will be a pulling or clawing motion . . . possibly contrary to pupular belief.

The force and speed of arm action has a direct influence on leg speed. According to Newton's Third Law of Motion, for every action there must be an equal and opposite reaction. Therefore, the higher the knee lift in running, the greater the driving force in the opposite direction with respect to the foot in contact with the track (equal and opposite reaction).

Thus we use higher knee lift in sprinting, and get greater driving force in propelling the body forward. This results in faster speed and less economy of effort with respect to races beyond sprint distances. When the leg comes forward for each step, it produces a torque action on the body which must be somehow counterbalanced or the body will rotate in a motion incompatible with good form.

The counterbalance torque is produced by the opposite action of the arms. Thus, as the right leg goes forward, its torque action is counterbalanced by an equal and opposite torque action as the left arm comes forward simultaneously.

Low arm action produces greater moment of inertia, but at the sacrifice of arm speed, High arm action results in greater arm speed, but at the sacrifice of inertia. On this basis alone, some compromise is necessary in accordance with the racing speed or objective sought.

Fortunately, we don't have to think of these details when running. Children, with no knowledge of running form, usually run with perfect style. An athlete who totally disregards form, and runs exactly as nature intended, usually finds his best form quickly.

The best way to achieve one's best form is much, much running at speeds bearing some relationship to proposed racing speed, over various distances and surfaces. Water seeks its own level - just as the human body will seek its form of maximum efficiency if given an opportunity to do so naturally, free of time-honored, incorrect, mechanically impossible, absurd old-maid's tales about form such as toe running and over-striding.

Footracing prizes will always be awarded to the athlete who crosses the finish line first, and not to the athlete who apparently has the "best form". Therefore, the attention paid to achieving mechanically correct form should be for the purpose of achieving greater efficiency in motion, which will in turn produce a positive contribution toward negotiating a given distance in the least time.

Reprinted with the permission of Scholastic Coach, March, 1959.

## 220 LOW-HURDLING AROUND A TURN

By: Wilbur L. Ross
Winston-Salem (N. C. ) Teachers College

Most coaches I've talked to feel that the 220-yard low hurdles around a turn requires no special practice methods. I beg to differ. While straightaway low hurdling may present little challenge to the tall, gangly sprinter - Dave Sime is a perfect example - hurdling around a turn is another proposition. It requires a distinct technique for one to excel.

Winston-Salem's Elias Gilbert, perhaps the world's top hurdler, demonstrating a 220-low hurdle around a turn.

I feel that many of the outstanding sprinters and hurdlers who've run this race have done so without any clearcut knowledge of essential technique. Such great sprinter-hurdlers as Harrison Dillard (23. 0), Ancil Robinson (23. 2), and Glenn Davis (23. 3), one of the strongest hurdler-quartermilers of all time, should have put the time of this race out of reach. Yet none ever broke 23. 0.

I believe all of them were capable of doing it in the low 22's without much difficulty, inasmuch as they could run 21. 0 or better on the flat.

In this paper, I'll try to present some ideas on the subject which should help any one coaching the event.

First in importance is the necessity of having the elements of force and balance working for and not against your efforts to run fast on the turn. The left-footed hurdler has a distinct advantage in this respect. He naturally leans into the turn with the lead leg in balance.

But I've noticed this about left-footed hurdlers: they have a tencency to take the barrier too high on the turns. This, I feel, helps reduce their power at the finish.

Right-footed hurdlers, on the other hand, have a marked disadvantage in that they have to bring the trailing leg into a balanced landing position before they can push off to their next running stride. Their inability to do this has often resulted in a deceleration of speed plus many nasty spills.

Be it as it may, the fact remains that all three of

of the world's sub-23.0 hurdlers are right-footed. That includes my two boys - Elias Gilbert (22.8) and Francis Washington (22.9) - and Charles Tidwell (22.7) of Kansas. The principles Gilbert and Washington adhere to are the ones I'll enumerate as we go along.

Most hurdlers fear the thought of: (1) running out of their lane, (2) losing their steps and hitting a hurdle, or (3) being unable to maintain their speed while hurdling deep into the turn, thus losing control of a well-timed race.

I try to have my hurdlers:

1. Run the first three barriers all out in order to build up momentum before entering the turn.

2. Have both the left-footed and right-footed hurdlers aim for the inside post of the barrier, with the thought of carrying the body weight as close to the inside of the lane as possible without stepping out of it.

3. Make every effort to accelerate their race on the turn, because it will help them maintain balance better. The law of centrifugal force applies here.

The accompanying sequence shows Elias Gilber, current world record holder in the 220 lows on the straightaway (22.1) and former American record holder on the turn (22.8), exhibiting excellent balance and drive while approaching the barrier.

Note his total relaxation in the face and arms, and little or no tension in the body. Note also the quickness of his trailing leg and high knee action on the descent. These generally denote drive and balance.

Before Gilbert attained this perfection, he experienced a series of failures, such as falling in two of our conference championship meets. When Francis Washington suffered the same fate, I decided that their failures were due to a lack of strength. So I worked out a method of rectifying this, and it worked out fine - as you may perceive by their development.

What I did was set out a 300-yard course, including hurdles 1, 2, 3, and 4, omitting 5, 6, and 7, and inserting 8, 9, and 10. After clearing the last barrier, the boys were expected to run out the remainder of the 300 yards with as much speed as they could muster.

This was practiced on the interval principle of

6 x 300 yards, with3-minute rests between each effort. I required them to do 35.0 - 37.0 until I felt they had built up enough strength to run an all-out race with the 5th, 6th, and 7th hurdles in their proper place.

## Should Be Run Often

The 200 hurdles on the turn should be run frequently because it's not only an exciting race but a great conditioner for the 440-yard hurdles. I believe the U.S. has gained dominance in the latter event because our boys gets more opportunity to run the low hurdles on the turn than runners in other parts of the world. This carry-over gives our boys greater relaxation in the first part of the race. Therefore, they finish stronger.

Francis Washington, national AAU record holder in the 220-yard lows on the turn (23.1), is also the American collegiate record holder in the 440-yard hurdles (51.5). Yet he has only run the longer race five times in his life!

If high school low hurdlers are exposed to running on the turn, they'll find less difficulty adapting while in college.

The future of this event may be looking up. Last year it was made part of every major collegiate meet in the country (NAIA, NCAA, and NAAU).

Reprinted with the permission of Scholastic Coach (February, 1959).

# NOTES ON SPRINTING

By: Bill Carroll
University of Oklahoma

There are two ingredients which are indispensable to fast sprinting; (1) instantaneous reaction to the report of the gun and (2) speed of muscular contraction. I believe these traits must be inborn and that we as coaches can only condition the sprinters to respond.

Too often neglected is the preliminary warm-up, both for races and for good practice. We ask our sprinters to run-walk-jog, to move for at least 20 minutes, hoping that they will run from a mile to 1 1/2 miles. Then they do calisthenics and stretching exercises. This latter is important, particularly exercises of the hurdle-stretching type. They do this for ten to fifteen minutes, then take a short rest. This warm-up period takes 35 to 40 minutes. The boys do not know until then what they are going to do; they do not get advance notice.

The first 25 yards are the most important part of a sprint race. It seems that if you are doing well at this part of the race, the tension will ease and confidence mounts. If you are a poor starter, you're just a poor sprinter at 60 or 75 or 100 yards. So we work very hard at 25 yards.

We like to start our boys at least three days a week, with a gun, driving out from 20 to 35 yards. We feel, as a coach, that it is better to stand directly in front, directly behind or to one side looking directly down at the starters so that we may better observe faults and correct them. In other words, we do not stand in the usual starter's position. We most often start our men from behind in practice and their reaction seems better.

Just to digress for a minute, let me throw this thought at you. Let's get rid of the baton in relay races. People come to see the athletes run, not to lose seconds on each baton exchange. Let's try to help the runners, not impede their progress.

We feel that it is important that the eyes be looking ahead. The head is down only at the start. To get their eyes up we use two finish yarns. These may be at 10 or 20 yards indoors. We also put out flags (from cross country) at five yard intervals along their lanes. The boys like it. Incidentally, we have a high-fi going in the dressing room and under the stands.

To avoid too high knee action - bouncing and high back kick - we run that boy in the middle with one boy right in front of him and another just behind. This forces the athlete in the middle to cut down on knee action and back kick. Of course we do this in rubber soles.

The finish is also very important and lots of attention should be paid to this part of the race. We know that the athlete should run to and through the tape, but too often

they don't do it. To help our men develop good finishing habits we use the following methods:

1. We like to set a quarter-miler up from 3 to 5 yards ahead of each sprinter. This will make him run for the tape.

2. We use a baton exchange, telling the outgoing man to get a good lead on the incomer, making him run through.

3. We put colored chalk (blue or red) on the finish line, then check to see who has broken the tape.

## NOTES ON RELAY PASSING

By: Larry Snyder
Ohio State University

There are several kinds of passes in common use, most of them quite adequate. Personally, I don't like the pass with the hand held on the hip. It's probably safe, but it doesn't accomplish the purpose of a good pass even though Eastment and the Olympic coaches use it. I like the pass with the receiver's hand held backward, forming a large V. The pass is made from the left hand to the right hand of the receiver. On a curve, the pass may be received with the left hand. The pass we use at Ohio State is just a little different; the receiving hand is raised almost to parallel and the incoming man passes with a downward stroke. The hands must be held steady.

In the medley relay, a half-miler has to take the pass from a sprinter. This pass should be taken like a sprinter's pass, not a half-miler's. On one of our good teams, for example, Owens used to pass to Charlie Beetham. With about 100 yards to go, Charlie would amble out about ten yards. He started to run when Owens hit the passing zone. Remember there is nothing in the rules against moving up in the passing zone.

The pass for the quarter-miler and the half-miler is not a sprint pass. In longer races, when the incoming man could tie up, the receiving man must watch at all times and make sure that he doesn't get away from the incoming man. The incomer yells to the fresh man when to go or to wait but the responsibility rests on the fresh man.

In sprint relays the receiver must have at least one mark, at eight or nine yards. The fresh man, in sprint position, starts to run, using his arms for about four strides before extending his arm for the pass.

(Q) In the sprint relay, did you see any of the Russian runners starting in a crouch position?

(A) Yes; they did it in practice, even in the broad jump and the hop, step and jump. They are trying everything, even methods that we have discarded. They try to get everyone to do things the same way.

Easton mentioned the case of men running in lanes. It is now suggested that the second man also run the curve in his lane, not cutting in until he gets around.

(Snyder) I don't like taking the contact out of the race. Neither the runners or the spectators know how the race is going until the runners hit the last straightaway.

In the sprint relays the pass is blind with the burden of responsibility on the incoming man. In distances from the quarter-mile up, the pass is visual, with the responsibility on the fresh man. Good passes require a great deal of practice. On a perfect pass there is a gain of two arms' lengths on each exchange.

Always try to suggest, to anticipate the boy's questions but if you don't know a thing, say so.

We work on a 12 months basis of training. During the off-season we ask them to run in summer about twice a week. When they get back to school, we have them all, including the sprinters, out on the cross country course. We do this for about four weeks, before going inside. After that our work would go something like this:

On Monday they do over-distance; we ask them to run a mile. When they come in we have them work on the weights, using a maximum of 35 pounds, including the bar.

Tuesday, striding run-throughs on the infield, on grass. The emphasis is on form, effortless running for about 150 yards, walk back then run again.

Wednesday, combination relays. The sprinters run 50 yards, the quarter-milers run 100, the half-milers 220, etc. After this we work on starts.

Thursday is a free day. Most of our sprinters compete in other events, in jumps, etc., and they use this day for practice. Then they do more work on the weights.

Friday we do pace running, 150, 300, 330's. We also work on starts. This is flexible; we always try to see that the boys enjoy their work so we make changes when we feel they are necessary.

## GLENN DAVIS

## THE 440

By: Larry Snyder
Ohio State University

The great change in running the 440 started at the Olympic Games in Helsinki, and particularly in the relay, which, as you remember, went in 3:03.9 . The race still isn't a sprint, but it's about the fastest non-sprint race I can imagine. The secret of running it well is relaxation, the ability to carry sprinting speed over the distance without tightening up. McKenley was superb on that day. Records are not planned; they happen when everything is right, the track conditions, the competition, and the crowd. McKenley ran the third leg with Charlie Moore running for us. Whitfield wanted Cole to run against McKenley; he thought he would do better running against him. Moore ran 46.4, starting about 12 yards ahead but McKenley ate him up in 44.5, finishing a yard ahead. Cole came up with 45.5 but the lead wasn't enough. Whitfield and Rhoden each ran 45.5 with neither gaining. This race was the start and if you think it didn't create a great change, just think how long Meredith's record stood.

Now something about Glenn Davis. He wasn't a quarter miler in high school because the low hurdles was his best event. At Ohio State he ran quite a few 300's and it was discovered that strength was his forte, not speed. In many cases he was tense, ran fast but looked bad so we stressed relaxation. At the Big 10 meet he was loose and relaxed..... How did he get in shape? Not by preparing for the 440. He always competed in several events; the sprint, both hurdles, the broad jump, the high jump and the relay. Every Saturday he got a complete work-out so that he didn't have to do much during the week. He has a tendency toward muscle soreness, possibly psychic. Some weeks he didn't work out until Thursday. He got into condition gradually. Preparing for the Big 10 quarter, he practiced alsone so he learned to force himself.

(Q) Did he run any over-distance?
(A) Never, except in his jogging warm-up. The sprint type doesn't need over-distance, two 330's are enough.
(Q) How fast does he run 330's?
(A) We aim at 22 seconds for the 220.

In his work-outs he ran 220's; the most, four in one day. Some times he would also run through in the broad jump. Early in the season he worked on the 400 meter hurdles; he would run six hurdles fast, repeatedly. He advises not to run the 400 meter hurdles all the way through alone. He thinks it tires you without doing much good.

(Q) How about the hurdles?
(A) He hasn't run any recently, mainly on account of soreness. He quit practicing them after the Penn Relays. He may start on them again for the A. A. U.
(Q) Has he ever had a serious injury?

(A) No. He says he feels sore, but it's never serious. He's always ready on the next weekend. He gets cramps after almost every meet. He talks salt for it, which seems to help, but he forgets to take it at times.

(Q) Do you believe in fall training?

(A) Yes; we get everybody out, averaging about three times a week. We stress form, starts, etc., but there are no time trials except for cross country men.

(Q) How about summer training?

(A) I don't think it's necessary since the boys are allowed to compete in A. A. U. meets.

(Q) How about pace in the 440?

(A) I favor even space, not like McKenley. It is hard to maintain relaxation when you go out too fast. Pace is especially important if you are running in the outside lane.

* * * * * * * * * * * *

## SPRINTING

By: Bud Winter with Ray Norton
San Jose State College

We don't believe that sprinters, like poets, are born, not made. Speed can be improved. How? How can you improve leg speed? Leg speed can be improved

(1) by relaxation
(2) by using a longer stride with good form
(3) by improving the ability to sustain speed - strength

The old idea that you can sap the strength of the sprinter is obsolete. Our sprinters work three times as hard as they used to.

The elements of good srpinting form:

(1) High knee action for longer stride. It's not natural so you have to practice it.
(2) The fore-leg reach, the "La Beach Reach". Next, high on the toes, with exercises to produce it.

(Q) What do you mean by "high on the toes"?

(A) We teach them to get up, to bounce. Times come down when they stay up high. - - - Lean: the power of the hips over the toes with a straight back. Next, run tall. This gets a man high on his toes and gets his weight over the pwer points.

Relaxation may be the key to great sprinting. Not the clenched fist, the tight jaw. This was proved in the Air Force; successful pilots were relaxed. Relaxation can be taught. Time a man over 30 yards three times, with a running start, then try it again, telling him to run through loose. Time will go down. Exercise walking with high knees and reach the fore-leg out. As for the arm action; short quick arm action to increase leg speed as opposed to lengthening arm action to lengthen stride? This is an individual

matter. Spring? Develop ability to spring forward. Exercise to develop the ankles.

Starts. Only after four to five weeks of conditioning, and then not on cold days and only after a good warm-up. Wind sprints and exercises back of the starting blocks. We like a balanced start, head down, weight slightly forward, eyes not more than eight feet down the track. We come up and forward. At the gun the arms are not lifted; they are thrown forward but not too far. The runner doesn't reach his full height until he is about twenty yards out. Three things about starting have been proven in experiments:

(1) Hard push and drive from the front blocks
(2) Value of the proper use of the arms
(3) Action of the rear foot. Bring it out low, flat and fast.

About twenty yards from the finish you prepare yourself mentally to go for the tape. Think "Faster - Looser" - - not "Dig and go". Drive through the tape. Roll the shoulder. We have a tape-breaking exercise.

Training. First, over-distance - from quantity to quality. From stamina to speed; this prevents injury. There is no timing in the first month. The test distance is 300 yards. As the season goes on, we do less work, faster. Alternate hard and easy days. Warm up with long wind-sprints, pick-ups (on grass), baton work; we also do continuous relays.

(Q) What does the sprinter concentrate on at the "get set"?
(A) On movement, not on the gun.
(Q) How about weight training?
(A) (By Norton)
I use weights early in the season. From 50 to 120 pounds, sitting on a table using a boot.
(Q) How about weights for body training?
(A) Not much, and only early in the season.
(Q) How long is your stride?
(A) 9' 3".
(Q) What is the greatest over-distance you do?
(A) 300's.
(Q) How long is the first step from the blocks?
(A) Straighten out the front leg to get the hip over the toe; this will show you the ideal spot.
(Q) I have a boy who carries his weight too far forward and has too much kick behind. What would you suggest?
(A) High knee action.
(Q) How fast do you run the 220 in practice?
(A) Often without timing. We stress relaxation.
(Q) How do you keep him fine when he's in condition?
(A) I don't know. Norton likes competition and his mental attitude is always good.
(Q) What do you know about hypnosis as an aid to relaxation?
(A) Not much in track. It has been used in England and Australia and was used in pre-flight programs with success.
(q) What do you tell your sprinters about the rear foot?

(A) We drive off the front block; we don't emphasize the rear foot.
(Q) How about breathing?
(A) We don't teach it unless there is a special problem.
(Q) How long is the work-out during the first part of the week?
(A) About 1 1/2 hours.
(Q) Does Norton take part in any other sports?
(A) He used to play football and also played basketball in high school but he has quit football.

* * * * * * * * * * * *

## DISTANCE RUNNING

By: Jess Mortensen with Max Truex
University of Southern California

We have learned much from foreign coaches, e. g. Gosta Holmer, and we still have much to learn. Stampfl, Gerutty and many others have contributed in helping us train distance runners. We don't have to apologize for our distance runners. Training is a twelve month job and we can't have two-a-day work-outs and still go to school. There are other factors also: national emphasis on the event and the psychology of distance running.

Stride. There is a different stride for different distances as demonstrated by Zatopek. The shortened stride has perhaps been overdone but you must drop the front foot so that it isn't too far forward of the center of gravity. Zatopek shortened his steps for the 10,000, and even more - practically trotting - in the marathon. The longer the race, the shorter the stride, -- Relaxed ankle - the longer the race, the nearer to flat-footed. Ball first, then the heel touch.

Fast runners, sprinters, don't have to worry about the braking effect of the extended foot. In the longer distances, there is less knee-lift and kick-back.

Arm and leg action are individual, adapted to each height and build at 1500 meters. Landy's stride is ideal. Running must be rhythmic all the way. The arms are used for balance - they say around the body. It is hard to change arm action. Body position - almost erect, chest out, arms fairly high. Just a little lean in distance running. Naturalness is important - the best way to run is the way it's easiest for you. The coach may have to correct over-striding, get the foot to drop down instead of throwing it out.

Distance training must be at least eleven months a year. To eliminate the fatigue factor, we work a lot on grass. It's easier on the legs, the surroundings are pleasant, work on the golf course if possible. Stampfl's repeat work is mentally tiring. You should get exhilaration out of a workout.

We use fall as a track work-out - everybody gets out in the fall including sprinters and 440 men, running two or three days a week. We use cross country only as a condi-

tioner. We like long hikes; weight lifting helps condition the upper body; resistance exercises help to build up the legs. Repetition running builds up the internal organs, the heart and the capillaries. How long the rest between interval runs? The purpose is to increase the size of the heart to increase pumping of the blood. It takes fast work to do that. Stampfl believes almost entirely in repeat 440's. Basically, he believes that if you have strength, you needn't worry about speed. Lincoln, for example, is not very fast. But I believe that you must practice speed, 220's and 110's.

(Remarks by Dr. Jim Slosson of USC)

When we get a freshman we study his style of running. Often there is some peculiarity such as over-striding. Compensate by running them in the sand, which is also a fine conditioner. Running barefoot strengthens the arch. Speed work uphill also helps to cut the stride. Short spurts on the hills to help lift the knees. Wind sprints on the grass, spurts of 20 to 30 yards. Stress relaxation to improve arm action. This shows after repeats; the toes will turn out and the knees spread. The schedule must fit the individual, must be modified if necessary, to the boy's capacity.

(Remarks by Max Truex)

Training is a hard, year-round job but the body can take it. Kucs trains eleven months then drinks vodka the other month. Elliott builds up with about six months of running 15 miles per day. He doesn't like to work on the track and only does so a few times a year. Cross country seems increasingly less important; the hard build-up is the important thing. Personally, I prefer to run on grass. Stampfl says that grass is O. K. but that a quarter mile should be measured off and timed. I do 15 or 20 440's, 10 halves. When I get tired I just take a day or two off. I climb ropes, do pull-ups; I'll try weight-lifting in the fall.

Stampfl says that for a 2 or 3 mile runner start out with 75 seconds, then come down a second a month. A miler starts at 70 seconds, then comes down gradually.

(Q) How long do you work out daily?

(A) About 1 1/2 hours.

(Q) I disagree with you about cross country. I believe it is because of these races that the distance times have come down.

(A) (By Mortensen)
The fall work-out is important and it is probable that the competition helps your boys bring their time down. We don't try to break the record every week. Incidentally, the foreigners usually point to one or two races per year.
(Truex)
I think you can overdo it by running hard every weekend. In my freshman year I overdid it.

(Q) What's the reasoning in interval training in which they run more 440's? Why not run fewer, faster?

(A) Stampfl says it isn't important to run at race pace or faster. He started

Lincoln with 70 second quarters and ran him nothing faster than race pace. My fastest work-out is in wind sprints and in a few quarters for time.

(Q) What role does diet play in your training?

(A) I don't follow any special diet, just a normal one. I do take supplements. I think they are good because you can be sure of getting everything you need in your diet.

# THE BROAD JUMP

By: Gordon Fisher with Greg Bell
University of Indiana

There are several reasons why we have been making only slow improvement in the Broad Jump. In other events, the High Jump, the Shot, the Pole Vault, there have been definite changes in form or technique. In the Broad Jump there has been no such change. Another thing is that the Broad Jump record is very good even though Owens was not a specialist. Not many men are willing to specialize in the event; they do not concentrate on it, not even Bell.

There are two natural forces against which the broad jumper competes, inertia and gravity. In addition, he must struggle against other conditions, the runway, the weather, etc.

We believe that it is impossible to get relaxation on the runway when thinking of markers all the way. We use as few markers as possible. Confidence is of the utmost importance. Bell uses only one marker at approximately 120 feet, adjutable to wind, softness of the runway, etc. He goes back three or four short steps for a total run of about 140 feet. He is careful about hitting his one mark squarely and wide open. From then on the emphasis is on relaxation. If everything is right, he doesn't have to look at the board during the last few steps.

The important thing is to get speed at the take-off board. I believe it is possible for any one to get speed in a relaxed manner in this way, without markers. Consistency in stride must be mastered with confidence.

About the jump. There are two standard procedures in the air: (1) the standard, assuming the position you are going to hold, or (2) the alternate, running in the air. Greg makes a very simple alternation. He takes off on the left, the right goes forward, comes back, the left forward, and that's it. The value? First, body control in the air, and most important, getting good final finishing position. You don't put your legs out and hold them there. This gives you the opportunity to have your legs where you want them at pay-off time.

Arm Position. Greg takes off with his arms high up, a striving for height. On good jumps, his legs are fully extended on landing and his arms are straight out, pointing forward, the body position parallel with the legs. He tries to delay that landing as long as possible. He doesn't need markers in the pit; if he does what is right in the air, he'll have a good jump.

Greg Bell. In Melbourne the track was too new, like running in plowed ground. We were jumping into a ten mile wind. The runway was too short and there was no way to lengthen it. I was ready mentally and physically to jump well, but the conditions were too tough. The runway wasn't over 120 feet in all.

(Q) What do you do to get height?

(A) There isn't much a coach can do. Mr. Fisher never forces me - we just cooperate. The factors in getting good height are relaxation and getting the center of gravity over the leg at the take-off.

(Fisher) We never were satisfied with the height but his speed and the finish were very good. We wish he could get off the board like Bennett. Greg ran the 100 at Penn in 9.7. Last year he cleared 5' 11" from a front position using a broad jump take-off. This is good practice.

(Q) Do you gather at the board, physically or mentally?

(A) I think I do. It's impossible to take off without a gather.

(Q) What exercises do you do for your stomach muscles to get your legs out?

(A) I suppose weights might help. I have very good stomach muscles.

(Q) What kind of take-off do you like?

(A) I could do without asphalt, ever.

(Q) Do you have any plan or design on your last step?

(A) I don't think I could change any apattern. I don't think of anything while jumping; it's automatic. Most people say that the last step should be shorter; with me it's sometimes longer. Even with a longer step I can get pretty good height.

(Q) Do you run off the board or do you drive?

(A) I try to hit the board pretty hard. Perhaps because of the longer stride at the end, I often hit heel first.

(Q) Have you ever jumped off rubber asphalt?

(A) I have never jumped from rubber. As for asphalt, it's dead when you hit it; there's no resiliency. (He uses a sprint shoe and there is a possibility of slipping without a heel spike.)

(Here there was some discussion of the hitch-kick. The following description of his jump was furnished by Bell:)

"I start with the conventional hitch-kick. The take-off is with the left foot. The right leg is advanced and at the same time, the left, or take-off leg, is curled upward and backward. The right leg is brought back in a full backward swing and then begins to follow the left leg

forward. At about the time that the right leg starts its final forward swing, there is a backward arching of the body in anticipation of the kip or snap up of the lower body. This snap is much like a jack-knife in the horizontal position. The arms, which were raised above the head in order to gain more leverage, swing downward and forward in an attempt to balance the upward swing of the hips and lower extremities.

At the moment of contact with the pit, the knees should be bent in order to absorb the landing shock and to permit the body to roll forward, to prevent falling backward."

(Q) What was your best jump in High School?

(A) 22' 1". I hadn't even begun to develop.

(Q) Have you ever been troubled with heel injuries?

(A) I've had heel injuries, but that comes from bad jumping, from hitting the board wrong. I could say something about the value of a heel cup.

(Q) Do you like the wide high school board?

(A) No, I like the narrow board.

(Q) In order to get speed and consistency, what would you think of starting kids with starting blocks?

(A) I don't think it would be worth the trouble. You can get up the speed by taking a few extra steps.

(Q) Couldn't you sacrifice some speed to get better height?

(A) Could be, but if I had to sacrifice one, it would be the height, not the speed.

(Q) How much jumping do you do during the week?

(A) Not much. I sprint a lot, but practice only a few times a week, mostly for form, pop-ups, etc. I never take a full run and jump.

## REPORT TO COACHES AT THE NATIONAL TRACK COACHES ASSN. MEETING ON TRACK SHOES

By: Bill Bowerman
University of Oregon

It was at the suggestion of several of us that president Eastment appointed a Facilities and Equipment committee. This committee was to concern itself with those things that would be of interest to our association and to the individuals for whom this group exists, the track men.

Shoes being the single most important piece of equipment in track and field, we have endeavored to find out what we recommend to you in the way of preference, and what we might ask of the producers of the shoes in the way of innovations, and finally, what can we expect in the way of price for the track shoe we want.

Two hundred questionnaires were sent to various colleges and Universities throughout the United States. Of the number sent out, forty-seven were returned. The questionnaire asked for a rating of the shoes of 8 different producers on the basis of excellent, good and poor. I was also naive enough to ask for the opinion of the rater on the percentage of mark-up or fair price estimate on the shoe.

You should be interested in some of the comment reported by your fellow coaches:

"If there is a good American shoe made, I have not seen it."
"The Europeans have proven the practicality of the fixed spike."
"The German Adidas is superior, but its' West Coast salesman should be masked and armed with a gun."

I mentioned that percentage of mark-up was a part of the questionnaire. It is difficult to learn what, if there is such a thing as a standard, is standard mark-up. It would appear that 30 to 35 per cent is the mark-up that the saleman expects to make. The coaches assume that 10 to 25 per cent is fair. It should appear then, that a pair of shoes that cost the seller $10.00 should sell for not more than $13.50. This is not actually the case. In practice, the seller expects to realize a profit of 35% of his selling price. By way of explanation: the seller purchases the shoe for $10.00 and sells it for not $13.50, but for $15.25. He would like to sell it for $15.00 for 35% of $15.00 is $5.25, so that amount is added to $10.00 making the selling price $15.25.

We should concern ourselves with two things as they concern shoes:

1 - what is the best foot wear that we can put on our athletes.
2 - what is a reasonable price to the producer, seller and buyer.

Following is a summary of the rating on the top four shoes by the coaches who answered the questionnaire:

| | Excellent | Good | Poor |
|---|---|---|---|
| Adidas | 25 | 10 | 3 removable spike, poor |
| Spot Built | 5 | 19 | 2 |
| Foster | 4 | 9 | 7 |
| Riddell | 3 | 7 | 2 |

A summary of the factory, German retail, and Western prices on the Adidas shoe is submitted for your consideration:

| | Factory | German Retail | Los Angeles |
|---|---|---|---|
| Melbourne 143 | $7.15 | $9.61 | $22.50 -- $17.50 |
| Olympic 146 | 6.85 | 9.10 | 17.50 -- 14.50 |
| Universal 151-A | 4.85 | 6.95 | 14.50 -- 13.50 |
| Ace 148 | 5.35 | 7.31 | 14.50 -- 12.95 |
| Start 153 | 3.95 | 5.07 | |
| Flat 271 | 3.10 | 4.00 | |

Import duty is 5% and shipping is fifty cents a pair.

The German retail outlet will be furnished on written request.

Don Canham has indicated that a shoe may be available here of U.S. production that will have the qualities of comfort, wearability and economy that we are looking for. Carl Crowell has used a shoe produced by Dr. Silverman that needs to be reported on.

Before concluding, I would like to say, and I believe that you join me, that it is strange that we are able to produce the best track men and the worst track shoes in the United States.

With the permission of this association, I would like to furnish the American Track shoe manufacturers with the rating on shoes. Further, I move that we direct our president to request the producer of the Adidas and other foreign shoes to make enough outlets available so that monopolistic prices are no longer possible.

# ALL-WEATHER SURFACES FOR TRACK & FIELD EVENTS

By: Payton Jordan
Stanford University

Stanford University has installed "all-weather" surfaces for field events which have satisfied all objectives. As in any such new undertaking, experts were called in to guide us in achieving the desire results.

Too, investigation was made of installations at various other schools that have used all-weather surfaces for track and field. Letters, papers, and generous cooperation were received from Coach Dave Rankin of Purdue University, Ed Weir of the University of Nebraska, and Bill Bowerman of the University of Oregon. From these papers and the knowledge of the following highly qualified persons — Mr. Verne Freeman, Freeman Paving Company, Palo Alto; Mr. Vaughn Marker, District Engineer for the Pacific Coast Division of Asphalt Institute; Mr. R. R. Ridell, Representative of the American Bitumuls and Asphalt Company; Mr. Roy Pierson, Foreman for Freeman Paving Company, and Professor Bert Wells, Engineering Safety Consultant for Stanford University — we arrived at certain conslusions in respect to "all-weather" surface installations at Stanford University.

Quite naturally, various climatic conditions will necessitate certain differing considerations. It would therefore seem to be a wise procedure to give full consideration to the following points listed below in achieving the surface you desire:

1. Hardness of surface.
2. Resiliency of the surface.
3. Ability of surface to allow penetration and withdrawal of running spikes.
4. Ability of the surface to resist shearing and twisting forces caused by athletes competing in all track and field events.
5. Weather resistance of the surface.
6. Water resistance of the surface or the ability of the surface to drain.
7. Cost of construction of such a surface.
8. Ease of maintenance.
9. Service life of the surface.
10. Effect of the surface on athletes legs and feet (heat).
11. Cohesion of possible asphaltic mixture sufficient to prevent adhesion of the mixture to running shoes.

In order to achieve the ideal surface, taking into consideration the items above, there appear to be several possible surfacing materials. Some of these are as follows:

1. Crushed volcanic cinders (1/4" Minus Crushed Aggregate).
2. Crushed brick.
3. Pulverized sea shells mixed with soil. (Burlingame High School, Burlingame-California, has used this effectively on their track).
4. Grasstex ( American Bitumuls and Asphalt Company).

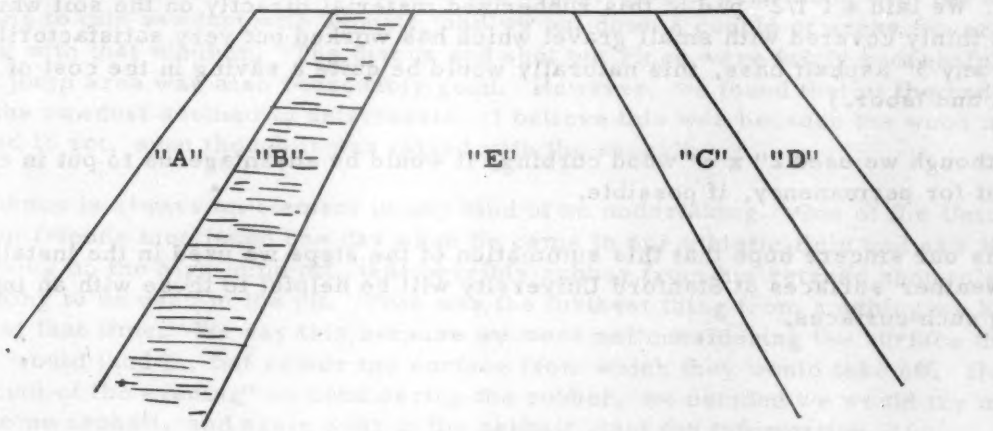
5. Grasstex with additional surface dressing.
6. Sand-asphalt mixture utilizing a light liquid asphalt (SC-2 or SC-3).
7. Asphalt-rubber mixture (used effectively at the University of Oregon).
8. Plant mix surfacing as base with some type of surface dressing.
9. Possible combination of the above.

From the standpoint of design and construction, it appears that the following at least must be considered:

1. Drainage of surface runoff.
2. Subsurface drainage.
3. Cross fall or crown allowable.
4. Raised or sunken cross section.
5. Type of equipment needed and accessibility for that equipment.

Since we had no positive results to go by in the immediate area of Stanford University, it was decided we would make a field test (six months) of several proposed methods. We decided to use the high jump area for the test. We first excavated the entire fan shaped area and placed a 3" Plant Mix base material - 1" maximum aggregate. As shown in the diagram below, we placed test strips as follows:

TEST MAT DIAGRAM




"A" Rubberized Asphalt - 1" thick
250 lbs. sand
300 lbs. 85/100 Asphalt
400 lbs. rubber buffings

"B" Rubberized Asphalt - 1" thick
350 lbs. sand
300 lbs. 85/100 Asphalt
300 lbs. rubber buffings

"C" & "D" Laykold "Grasstex" 1" thick, per specifications of American Bitumuls & Asphalt Co., Spec. G-4.

"E" Dense Plant Mix - 1/4" Maximum Aggregate

Trials by our track athletes indicated the following conclusions:

The rubberized asphalt of strip "B" gave by far the best results. Both the Laykold section and the dense asphalt section proved unsatisfactory to shoes with normal spikes. The entire area was finally covered with an overlay of rubberized asphalt material, type "B".

The placing of this rubberized asphalt is slightly different from ordinary asphaltic material. As it comes from the hot plant, it is a very gooey, stringy material. It can be hauled without any difficulty. The material is very hard to rake as it is so fibrous but after rolling (3-5 ton tandem roller) the material looks open and porous but of uniform thickness. To overcome the porous effect, we sprayed the surface with a fine fog seal of emulsified asphalt and broomed dry rubber buffings into the voids. The result was a more uniform texture.

The rubber we used was the by-product of various tire recapping firms in our locality. This is a waste item and can be obtained free. The process of mixing is quite expensive since the pug mill must be charged with the rubber by hand. Also, the high percentage of liquid asphalt makes the ton price of the mix very high. The actual cost at the plant (not including labor to charge the rubber) runs approximately $10.00 per ton.

We have since put our broad jump and pole vault runs down in a slightly different manner. We laid a 1 1/2" pad of this rubberized material directly on the soil which had been thinly covered with small gravel which has worked out very satisfactorily. (Without any 3" asphalt base, this naturally would be quite a saving in the cost of material and labor.)

Although we used 2" x 6" wood curbing, it would be advantageous to put in curbs of cement for permanency, if possible.

It is our sincere hope that this summation of the steps we used in the installation of "all-weather" surfaces at Stanford University will be helpful to those with an interest in trying such surfaces.

# OREGON'S HARD SURFACE

By: Bill Bowerman
University of Oregon

Was it in 1952 or 1953 that Nebraska University gave the NCAA track contestants an opportunity to compete on asphalt in the high jump, discus, and shot put? In any event, a new era was open for surfaces for track and field competition. Since that time, several of the schools in the Big Ten (Michigan, Purdue, Ohio, Northwestern) have used asphaltic runways for the broad jump, high jump, and pole vault. The harder surface, and one that requires little maintenance, has also seen a rule change in the shot put and discus rings where cement is used for a hard surface that requires no maintenance.

On returning to the University of Oregon campus from the NCAA track meet which was held in Nebraska, we immediately started seeking information from the local asphalt plants as to how to put down a pole vault and broad jump runway of asphaltic concrete that would give us an opportunity to work in our rather damp climate, and also to see what we could do in the way of experimenting. We did put down a runway in our practice area for the pole vault and the broad jump. It was our experience that either we do not know enough about how to put it down, or our climate was too cold, and the runway proved almost unusable. In other words, it was so hard that both our broad jumpers and pole vaulters developed "shin-splints" as a result of working on these runways even in rubber-soled shoes. One of the asphalt plants went along with the idea of attempting to mix sawdust with asphalt, and we put down a couple of areas for practice purposes with that medium. The discus and shot put rings were fairly successful, and the high jump area was also reasonably good. However, we found that at the end of one season the sawdust seemed to deteriorate. I believe this was because the wood material tended to rot, even though it was mixed with the asphalt.

Chance is always an element in any kind of an undertaking. One of the University of Oregon friends mentioned one day when he came to our athletic field and saw that I was working on the high jump pit, that possibly rubber from his retread shop might be a good thing to be used in the pit. This was the furthest thing from anything we had considered at that time. We say this because we were not considering the surface that the jumpers would land in, but rather the surface from which they would take off. However, in the "cool of the evening" on considering the rubber, we decided we would try mixing it with some asphalt, and again went to the asphalt plant for information.

It is an amazing thing how many different types of asphalt there are. The one suggested by the local asphalt people was emulsified asphalt. This is an asphalt that has some medium in it that makes it possible for it to be mixed with water and then it can be mixed with whatever substance one wishes to make a surface from.

Our first experimental runway for the pole vault was one in which we mixed emulsified asphalt with rubber in a concrete mixer and put it down to a depth of about 2" the full length of the runway. This seemed to be fairly satisfactory, and bore up under the traffic fairly well. However, we put a second runway down and found that when we put it over an old runway with concrete sides on the runway, there was little chance for the

water in the mixture to escape. This experiment turned out to be a complete failure when rain came immediately after the completion of the laying of the runway, the result being that the tar in the mixture rose to the top and we had a thin skin of tar on top and a mess of loose rubber underneath. It was necessary to take up the entire runway.

Our next asphalt and rubber runway was also one of emulsified asphalt of another grade. This was called rapid set, and it was not mixed in a concrete mixer. An asphalt spray rig was used, and the asphalt was sprayed directly on to the area that was to be surfaced, and a thin layer of rubber was sprinkled over the top. The excess rubber was brushed off and a second layer of asphalt was sprayed on and more rubber sprinkled over the top until we had five laminations, and a depth of about 1/2 inch. This was quite a satisfactory runway, and one that is still used on our Varsity broad jump runway. At the end of three seasons it has had no maintenance, but does show some places where it is worn.

A year ago we decided to see if it was possible to mix hot asphalt, the kind that is used in this area for building highways, with rubber. Using a concrete mixer and two flame throwing weed killers to keep the concrete mixer hot, we stirred up about one part asphalt to three parts rubber by volume, and laid the mixture down in the broad jump runway. This was an extremely slow process, and at the end of six hours we had laid 15' of broad jump runway. We also found that at the end of six hours we had a terrible mess inside the concrete mixer and one that took several hours to clean up. However, we did determine that we had probably the best and toughest type runway that we had ever seen. The problem was to determine how to make this mixture, keep it hot enough so it would pour, and do the job in a reasonable length of time.

We decided to try a roofer's tar pot. Further, we had an area indoors that is used both by the baseball squad and also by the track squad to work out in the wintertime. We decided we would put down a block of asphalt and rubber that would be about 12' x 12' and 1 1/2" thick. This was an area that was used as the batting area for the baseball players and it was also exactly the same spot that is used for the take off for the pole vaulters. It seemed like one that would get a maximum of wear.

We were able to get a hold of a roofer's tar pot. The rest of the material and equipment were as follows: a 55-gallon drum to get the hot asphalt from the asphalt plant; two 5-gallon tar buckets to carry the hot asphalt from the drum to the mixing pot; two 5-gallon tar buckets for the dry rubber; two 5-gallon tar buckets for the mix when it was ready to be taken from the tar pot; a wooden paddle to stir the mixture up in the tar pot; a flat shovel to trowel the mixture in the area to be surfaced; a container for diesel oil for keeping the shovels, rakes, and other paraphernalia clean. We also found that the kerosene weed burner was an extremely handy implement, not only to heat the shovel before troweling, but also for the purpose of cleaning up implements during and after the work.

Preparation: Put something under your finish of asphalt and rubber; I believe rock is the least expensive. Two to six inches of rock as a base; three-quarters inch, or probably better still, one-quarter inch rock. The rock should be firm, a light roller might be used, but probably not necessary. (I suggest base, because grass will

grow through any asphaltic concrete. It would probably also be a good idea to use a weed killer to keep weeds from growing through. The rubber asphalt should be 3/4" to 1" in thickness. If the hot pot has a big molasses gate on it, your rubber and asphalt might flow out of the pot right where you want it - ours has no gate. Three men, who know what they are doing, can lay the 1" x 4' rubber and asphalt at the rate of about 50' an hour. We went to the asphalt plant with a 55-gallon drum and procured about 2/3 or 40 gallons. We had a molasses gate ready to put in the bung. We brought the asphalt to the location where we had six 20-gallon garbage cans of dry rubber, the pot, and the other gear. We lit the pot, poured in two 5-gallon cans of asphalt, slowly mixed in the rubber; we got in three to two parts at the start. Finally we were able to get in four parts to two. When thoroughly mixed and really hot, we dipped it out with a 5-gallon tar bucket and poured it in the desired location and smoothed it immediately with the shovel. As two buckets were taken out, we added one of asphalt and one of tar, so we kept it continuously hot and mixed. We used this runway on our Varsity pole vault this last year, and at the end of one complete season it has not a mark on it. It was also used in all kinds of weather, rain or bright sunshine. In the Pacific Coast Conference Championship, the weather was not warm and it rained off and on during the entire meet. Southern California's fine pole vaulter, Morris, was the winner and had 15'1/2". There was a second place tie for second at 14'4". The type asphalt we use in this area is 85-100 penetration. It would seem to me that they type used in the Big Ten, 60-70, might be better. It is not available in this mild climate of the Pacific Northwest. The reason I say it might be better is because on extremely warm days our runway softens up. However, it does not get tacky. We have found a very easy cure for that. We have a water outlet close to the jumping area, and a couple of minutes of watering it down causes it to return to the excellent surface that we are used to.

We do not recommend the emulsified asphalt for the following reasons:

1. It is not as good as the hot.

2. It bleeds.

3. It is much more expensive. (At the plant we were able to get emulsified asphalt for 50¢ per gallon whereas the 85-100, which we pay for by the pound, costs about 15¢ per gallon.)

Among the other experiments that we made in addition to the rapid set asphalt and the slow set asphalt, we also used two types of roofing tar. The hot roofing tar , which seems to be much heavier than that road asphalt, seems to set up too hard. We used the cold roofing tar and, while it seemed to make an excellent surface and did not bleed, it was too soft.

In conclusion, it is our recommendation that each school that uses this should experiment to determine what is best for their area. We would suggest that they put something like a shot put ring, or possible a high jump take off, or a broad jump or pole vault runway. We have given the information above to Stanford University where Payton Jordon is doing some experimentation; to Ralph Higgins at Oklahoma A & M; to George Rider at Miami University at Oxford, Ohio; and Percy Beard at the University of Florida also indicated that he was interested in doing further study before putting

down a complete track. Several of the high schools here in the state of Oregon have also put down small surfaces, and one high school has indicated that they are interested in putting down a complete 440 yard track.

It is our considered opinion that a 440 yard track of this surface would be less expensive than the best cinder or clay track that one could put down. In addition to making an all-weather running surface, we believe that the lines could be put in permanently, thus saving one of the big headaches that we track coaches run into.

I would certainly be interested in any observations that any of the track coaches would wish to make, and we, finally, again recommend that the weather conditions would probably dictate the particular type of tar or asphalt that one would use in the mix.

# RUBBER ASPHALT RUNWAYS

By: Stan Pavko
Modesto Junior College

There have been many requests for the formula and procedure of placing all-weather surface for the broad jump, pole vault, and high jump runways which have been installed at Modesto Junior College.

We wish to thank Payton Jordon, Stanford's world famous track coach, Tom Moore, director of the California Relays, Jack Westervelt, Manager of Standard Materials Company, and Tom Mellis, original founder of the California Relays, for their generous contribution in providing these runways to our athletic field.

The mixture used as recommended by Payton Jordon seemed to be about right. This mixture was as follows:

350 lbs. sand
300 lbs. 85/100 asphalt
300 lbs. rubber buffings

The only difficulty Tom Moore and Jack Westervelt encountered was in laying the mixture.

This rubberized asphalt is different from ordinary asphalt and must be mixed in a hot plant at 400 degrees and must be hot when placed in the runways. As soon as the mixture starts to cool it becomes difficult to handle. In fact, it is difficult enough to spread evenly when it is hot. The rubber in the mixture makes it hard to rake smooth.

The best advice would be to pour one runway at a time and pick a very hot day so that the mixture will not cool too rapidly.

First thing done was construction of 2" by 4" curbings. Next a batch of mixture was poured directly on the ground 2" to 2 1/2" thick and this proved to be too spongy.

The next procedure is the one highly recommended and which was a 2" asphalt base poured and rolled one day. Nexy spray of emulsion over asphalt before pouring rubberized mixture to help it stick to the asphalt.

When pouring the rubber mixture you must get it evenly filled before rolling. Fill the forms and rake out as evenly as possible to a height of about 1/2" (loose) above forms.

Remember the total thickness of the rubber mixture shall not exceed 1 1/4 - 1/2 loose before rolled.

The mixture when rolled will compresstto 3/4" thickness to the height of the forms. Patching low spots was tried but the mixture would not weld in after it was once rolled.

**Do not over-roll runways, but make one or two passes with medium weight roller to flatten and smooth. Too much rolling will cause cracks from stretching rubber.**

**To deflect heat from the asphalt and to prevent any stickiness on spikes, sprinkle entire runway with gypsum. The gypsum treatment gives a good appearance and keeps heat from softening the mixture.**

**The cost of this process will vary in different localities. The rubber buffings can be obtained free from tire recapping firms as it is a by-product. The labor and other materials used will be the major cost and it is estimated at $12 to $20 per ton laid.**

**It is our hope that this summation of steps used in the installation of "all-weather" surfaces at Modesto Junior College will be helpful to others.**

# ALL-WEATHER SURFACES

By: Robert Epskamp
Monroe High School
Monroe, Michigan

## INTRODUCTION

Soundly constructed facilities for track and field that are well-maintained for both practice and meets will invariably improve the caliber of competition. A number of schools throughout the United States have constructed asphalt surfaces to obtain more easily maintained facilities. With "all-weather" surfaces home meets are not suddenly disrupted when rain appears. In cases where invitational meets are hosted the surfaces are just as good for the finals as they were for the preliminaries.

## PRELIMINARY CONSIDERATIONS

Monroe High School has installed "all-weather" surfaces for track and field events. As in any such new undertaking, experts were called upon to guide us in achieving the desired results. We received excellent cooperation from Coach Payton Jordan of Stanford University, Bill Bowerman of the University of Oregon, Ed Weir of the University of Nebraska, Dave Rankin of Purdue University, Percy Beard of the University of Florida, and Rut Walter of Northwestern University. After cooresponding with these coaches and consulting with James Godfroy, Director of Public Works Monroe, Michigan, we arrived at certain conclusions with respect to "all-weather" surfaces.

We found that there were a number of possible surfacing materials, and consideration should be given to the merits of each type or combination of types to achieve the ideal surface for your area.

Some of the possible surfacing materials are as follows:

## TYPES OF ALL-WEATHER SURFACES

1. Crushed brick.
2. Pulverized sea shells with soil (Burlingame High School, Burlingame, California, has used this effectively on their track).
3. Grasstex (American Bitumulus and Asphalt Company, San Francisco, California. University of Florida has an entire track of this material.

4. Grasstex with additional surface dressing.

5. Sand-asphalt mixture (Purdue University and Northwestern University use this method effectively but at different penetration).

6. Asphalt-rubber mixture (used effectively at the University of Oregon and Stanford University).

7. Possible combinations of the above.

Quite naturally various climatic conditions and availability of material will help determine the type surface that will suit you best. Coach Payton Jordan, Stanford University, lists some points that we felt were well worth considering in determining the surface desired:

1. Hardness of surface.

2. Resiliency of the surface.

3. Ability of surface to allow penetration and withdrawal of running spikes.

4. Ability of the surface to resist shearing and twisting forces caused by athletes in all track and field events.

5. Weather resistance of the surface.

6. Water resistance of the surface or the ability of the surface to drain.

7. Cost of construction of such a surface.

8. Ease of maintenance.

9. Service life of the surface.

10. Effects of the surface on athletes legs and feet.

11. Cohesion of possible asphaltic mixture sufficient to prevent adhesion of the mixture to running shoes.

In our opinion, asphalt and rubber gave us the best surface to meet all the objectives that we considered. The Universities of Stanford and Oregon are both very satisfied with their asphalt and rubber "all-weather" surfaces. Before making a decision as to the type of "all-weather" surface you are to select, we suggest you take a positive approach and get expert advice. Look at facilities of other institutions using "all-weather" surfaces or use a technique such as Stanford University used effectively in creating a field test of several methods. Stanford University used the High Jump area for the test and after a couple of months their conclusions were that they received by far the best results from the area mixed with asphalt and rubber. It was correspon-

dence and experiences of others that confirmed our opinion that asphalt and rubber would be the best "all-weather" surface for us.

Since an "all-weather" surface is going to provide a long-life field event area, we suggest your considering the location of the runways so that they provide maximum benefit to athletes and spectators.

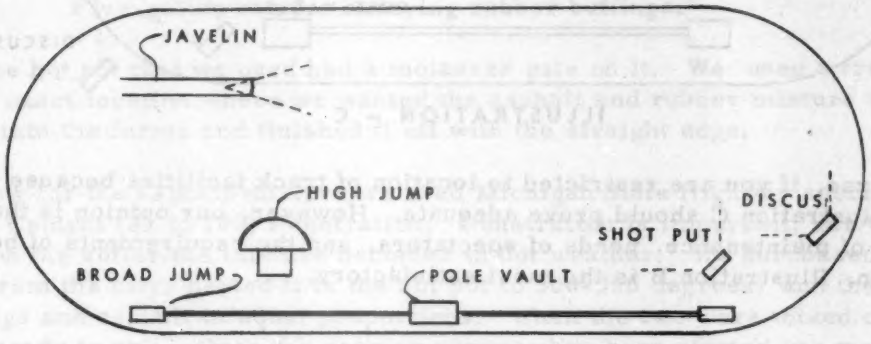



ILLUSTRATION - A

Note that Illustration A shows a track design excellent for both contestants and spectators. The Pole Vault and Broad Jump use the same runways and since wind direction determines the direction of the run in both instances, no interference can result.

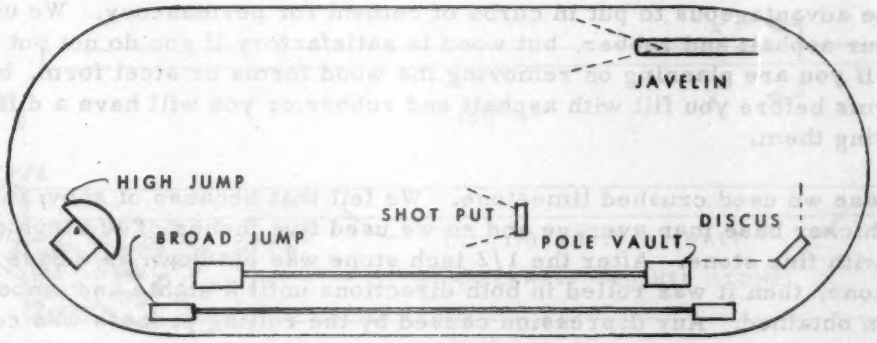



ILLUSTRATION - B

Illustration B provides for two separate runways, but involves only one runway for each. The length of your area should help you determine if you can get a long enough run as in Illustration A or if you need greater area as in Illustration B. We think most track authorities agree that a minimum of 115' are needed to insure proper athletic performance for the Broad Jump and Pole Vault approaches.

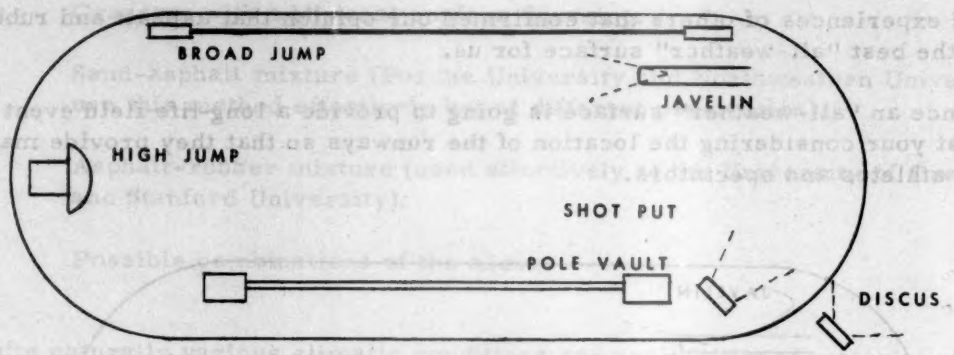



ILLUSTRATION - C

Of course, if you are restricted to location of track facilities because of an inner field, Illustration C should prove adequate. However, our opinion is that for cost and ease of maintenance, needs of spectators, and the requirements of best athletic competition, Illustration B is the most satisfactory.

## CONSTRUCTION OF "ALL-WEATHER"

## SURFACES FOR TRACK & FIELD EVENTS

The first step in the actual construction of the asphalt-rubber surfaces is the preparation of the subgrade. The four corners of the area or runways should be determined by careful survey, and stakes set indicating the exact position of these corners and the final elevation of the runway surface. Although it is not necessary, we feel that it would be advantageous to put in curbs of cement for permanency. We used steel forms to lay our asphalt and rubber, but wood is satisfactory if you do not put in concrete curbs. If you are planning on removing the wood forms or steel form, be sure and oil the forms before you fill with asphalt and rubber or you will have a difficult time in removing them.

As a base we used crushed limestone. We felt that because of snow and rain we should use a thicker base than average and so we used five inches of 1/2 inch stone and then keyed it with fine stone. After the 1/2 inch stone was put down as a base and keyed with fine stone, then it was rolled in both directions until a stable and smooth subgrade had been obtained. Any depression caused by the rolling process was corrected by filling with additional stone, and constant checks were made to assure that the subgrade would not vary from its proper elevation. If you do not have a level subgrade, then your calculation of surface dressing will be incorrect and will result in an inferior job. A tip that we feel will be beneficial is to use weed killer on the base before applying the asphalt and rubber mixture. Weeds will grow through any asphaltic concrete.

When our base was ready we then needed our asphalt and rubber mixture along with equipment. The equipment that we used was:

1. A hot pot (roofing pot).

2. Paddle to stir and mix.

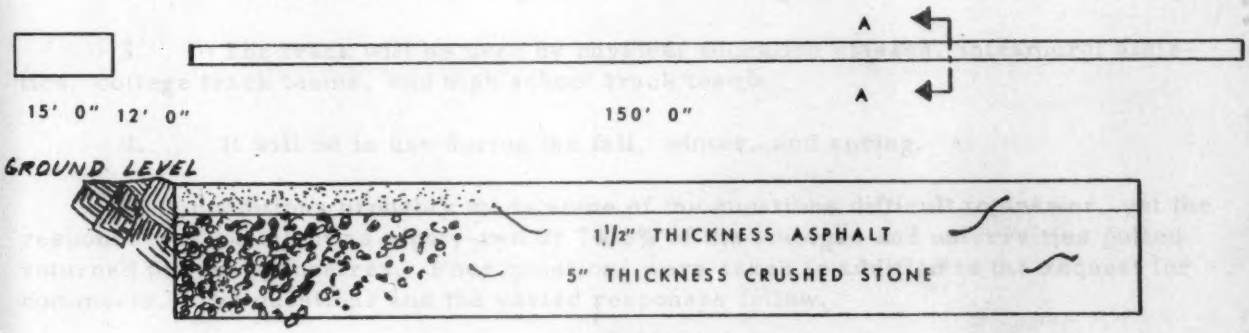
3. Trowel and straight edge made from 2 x 4.

4. A container for kerosene for keeping shovels and equipment clean.

5. Five-gallon can for carrying rubber buffings.

The hot pot that we used had a molasses gate on it. We used a truck to pull the pot to the exact location where we wanted the asphalt and rubber mixture and then just poured it into the forms and finished it off with the straight edge.

Now for the asphalt mixture we used Michigan State Highway specification SOA Asphaltic Cement (85 to 100) Penetration. Penetration is important, for the higher the penetration the softer the mixture becomes in hot weather. We purchased the asphalt directly from the city, heated it in the hot pot to 300-350 degrees, and then mixed rubber buffings and asphalt in equal proportions. When the two were mixed completely, we were ready to roll. Once the pouring process has been started you must smooth the mixture immediately. Then we dusted on top enough rubber grindings to barely cover. One of the reasons why this process is quite economical is that one-half of the mixture is free. We obtained all the rubber buffings we needed free of charge from local tire recapping firms. This is a waste item and should be obtained free in most localities. We screened our rubber buffings and felt that the additional time involved was well spent because paper was somethimes thrown in with the grindings.




SECTION A-A
ILLUSTRATION – D

THE ATHLETIC JOURNAL

Illustration D. will show our broad jump runway and the thickness of crushed stone and asphalt - rubber mixture. We experimented with varying thicknesses of asphalt-rubber and found 1 1/2" to be most satsifactory. We felt that, if you live in an area where you have winter freezing and thawing, five inches of crushed stone will provide satisfactory protection from heaving.

Whenever a discussion is held on our asphalt surfaces, invariably the question of cost arises. We found that the installation of "all-weather" surfaces cost less than we first expected. Of course cost will vary with each locality, and labor is an important factor to consider. We put in an approach to the high jump, a shot circle, one 3' x 120' pole valut runway, and one 3' x 130' broad jump runway for $150. The field maintenance man, members of the track team, and coaching staff provided most of the labor.

Our opinion on the type of "all-weather" runway we installed is that it has satisfied all objectives. The caliber of our athletic competition has improved, as well as that of our competitors. The "all-weather" surfaces have been used by competitors from over fifty different schools and all boys questioned have liked the surfaces extremely well. We have not had any cases of shin-splints or leg injuries. The athletes can use either spikes or neaks although we insist on 3/8" spike or less. We have never found the surface to stick to the bottom of our shoes. Our field maintenance man is very happy about our "all-weather" surfaces for he can devote the time that he spent on runways to other areas. No longer do we fear the rain clouds, for our "all-weather" surfaces are ready for use immediately, rain or shine. After fifty-six boys from 28 different schools had broad jumped two hundred forty-five times during the Dick Waters Invitational Night Relays, we felt that the runways might show some wear, but they were the same as they were when installed. Our only disappointment with "all-weather" surfaces is that we did not install them sooner and obtain all the benefits that are derived from them.

# A QUESTIONNAIRE STUDY

## REGARDING SURFACE MATERIALS

By: Bill Jordan
Wake Forest College

A number of institutions are now experimenting with the use of varied forms of asphalt black-top for use in approaches, take-offs, and circles. The University of Florida has gone a step further in the use of "Grasstex" asphalt for their running track. Florida reports that test have shown its new track surface to be very satisfactory.

Wake Forest College is building a new track and with an eye to all of the latest developments in the area of track construction, this survey was made to study the possibility of surfacing the track and runways with some type of asphalt mix rather than stick to the age old method of surfacing with clay or mixed cinders and clay.

Questionnaires were sent out to coaches representing one hundred and ten colleges and universities picked at random throughout the nation in hopes of getting reactions and comments from the men who are the most concerned with the facilities they have to work with. The coaches were asked to consider several things in deriving their answers. These considerations were as follows:

1. The Wake Forest track will probably have something less than ideal maintenance.

2. Winston-Salem has a greater-than-average rainfall with some freezing.

3. The track will be used by physical education classes, intramural athletics, college track teams, and high school track teams.

4. It will be in use during the fall, winter, and spring.

Such conditions probably made some of the questions difficult to answer, yet the response was excellent as eighty-two or 74.5% of the colleges and universities polled returned the questionnaires. Four questions were asked in addition to the request for comments. The questions and the varied responses follow.

In answer to the first question; "What is the best surface for our shot and discus rings?", seventy-five or 91.4% of the coaches commented. Table I lists the varied surfaces in their rank order of acceptance, according to the per cent of coaches selecting them.

Table I

Per cent of the seventy-five coaches recommending surfaces for shot and discus rings

| Rank | Type of Surface | Per Cent Selecting |
|---|---|---|
| 1 | Concrete | 72% |
| 2 | Asphalt | 20.1% |
| 3 | Cinders & Clay | 5.3% |
| 4 | Plyboard | 1.3% |
| 5 | Laminated Celotex | 1.3% |

Seventy-six or 92.8% on question two of; "What is the best surface for our high jump approach?" Table II presents the rank order of selection.

Table II

Per cent of coaches selecting certain surfaces for high jump approaches.

| Rank | Type of Surface | Per Cent Selecting |
|---|---|---|
| 1 | Asphalt | 71.1% |
| 2 | Cinders & Clay | 23.6% |
| 3 | Clay | 3.9% |
| 4 | Laminated Celotex | 1.3% |

A third question asked of the coaches was; "What is the best surface for broad jump and pole vaulting runways?" Seventy-four or 90.2% expressed their opinions. Table III presents the first four ranked surfaces.

Table III

Per cent of coaches selecting surfaces for the broad jump and pole vaulting runways.

| Rank | Surface | Per Cent Selecting |
|---|---|---|
| 1. | Asphalt | 75.6% |
| 2. | Cinders & Clay | 20.5% |
| 3. | Clay | 2.6% |
| 4. | Laminated Celotex | 1.3% |

Table IV presents the ranked surfaces in response to the question; "What is the best surface for the running track?" All eighty-two or 100% of the coaches had comments of varied natures to make on this.

Table IV

Per cent of coaches selecting surfaces for the running track.

| Rank | Surface | Per Cent Selecting |
|---|---|---|
| 1. | Cinders & Clay | 45.1% |
| 2. | Asphalt | 16.0% |
| 3. | Haydite (Burned Shale) | 3.6% |
| 4. | Clay Only | 2.4% |
| 5. | Granite & Brick | 2.4% |
| 6. | Cinders Only | 1.2% |
| 7. | Leotite (Crushed Red Dog) | 1.2% |

There were many coaches expressing some difficulty in giving a definite answer to the question on the running track. Table V compiles the percentages of their most frequently occurring comments.

Table V

| | Comments | Per Cent Making |
|---|---|---|
| 1. | Have no experience in anything other than cinders and clay and thus do not feel justified in recommending any other type of surface. | 29.2% |
| 2. | Would like to know more about various asphalt mixtures with consideration for own use. | 29.2% |
| 3. | Of the 45.1% selecting cinders and clay as the best running surface, 32.4% of them feel that an asphalt mix of some type is the ultimate answer in the future. | |

From this short study certain definite trends can be established. Proper maintenance of tracks at most schools is difficult to obtain. With asphalt, maintenance would be negligible and the track would be in top condition, ready for meet use twelve months out of the year, regardless of weather conditions.

In an enclosed note sent to the coaches with the questionnaire, some worry was indicated about a boy's daily running on a hard surface. There was some agreement to this feeling, especially on the running track. However, those who already have asphalt runways and approaches have not experienced any unusual difficulties that can be attributed to the hard surface.

In conclusion, the concensus of opinion dictates that the shot and discus circles should be constructed of concrete while the high jump, pole vault and broad jump approaches should be built with an asphalt mix. Most of the coaches feel that cinders and clay still makes up the best running track and this thinking results directly from inexperience with any other type of surface. All are keeping their ears and eyes open toward finding a suitable semi-hard surface finish, whether it be "Grasstex" or something else.

What bearing have these results had on the type of construction of the Wake Forest track? Wake Forest will follow the school of thought of; "wait and see", as far as track building goes. The shot and discus rings will be of concrete while everything else, approaches, runways, and running track will be constructed of a baked clay, "Tuflite", mixed with yellow brick clay. The "Tuflite" is a cinder substitute.

The thirty-foot wide, elevated track should be one of the finest with 150 x 4 feet elevated runways, cross tile drains and catch basins every fifty feet and weep holes in the curbing every four feet. It is laid out to accomodate a two-twenty on the straightaway and a quarter around one turn.

The two broad jump pets are 8 x 18 feet with one set fifteen feet from the take-off board and the other set twelve feet for use in physical education and intramurals. Both the high jump and polevaulting pits are 16 x 16 feet allowing the athlete to jump or vault from two directions. All pits are drained by a catch basin located in their center. The javelin approach will be turfed with a golf green-like grass to enable the thrower to get a more consistant step pattern on his approach.